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ABSTRACT

This competency-based module uses the Ocean County (New Jersey) Vocational-Technical Schools curriculum-infused model for infusing basic skills instruction into vocational education. The model demonstrates the relationship of vocational skills to communication, mathematics, and science. The document begins with a philosophy statement; preface; a table that explains the number of hours required for academic credit in various programs and the number of those hours that are devoted to basic skills and vocational activities; matrices that show in which courses specific basic skills are taught; a list of objectives; and an explanation of student activities. Most pages in the document are tables that describe the relationship of vocational skills to basic skills within the automotive mechanics program. These pages are organized by instructional unit and the topics within them. For each topic and associated task(s) are listed the theories and the communication, math, and science skills covered. Also listed are the expected student outcomes. The 20 instructional units included are: career orientation; fasteners; measurement; safety; tires; lubrication; cooling system; battery service; electrical systems; starting systems; charging systems; brake systems; suspension systems; wheel alignment; fuel systems; emission controls; drive trains; engine systems; tune-up; and air conditioning. (CML)

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Competency Based Vocational Curricula

COM-LINK

With Basic Skills And Academic Linkages

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In Cooperation With The

New Jersey State Department of Education

Division of Vocational Education

And

Ocean County Vocational-Technical School

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Ocean County Vocational-Technical School

Automotive Mechanics

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PHILOSOPHY OF EDUCATION

The Ocean County Vocational-Technical Education Program should consist of those courses, activities and experiences which are designed to prepare students for a successful entrance in a given field of work. The program should be based upon an analysis of the worker needs of the field of work, the opportunities and requirements for entrance, and the particular characteristics and needs of the students.

We believe that:

The school should educate and train the students to live effectively in our ever-changing world.

The school should provide, for each student, intensive training toward general and specific job objectives, and setting standards of performance in keeping with the requirements of that particular field of work.

All students should evidence the interest, aptitude, and ability to profit from the specialized instruction, and this should be a condition of entrance into or continuance in a given field of work.

Equal attention should be given in the school program to develop sound character, good citizenship, ability to think critically, and maintain good mental and physical health.

The school must be constantly striving to fulfill its ultimate purpose; that of serving the students and the community. The school should give careful consideration to the needs, interests, and capacities of the students and the educational and technical background, experience, training, and professional interest of the professional staff as they develop a working philosophy of education.

PREFACE

The curriculum format employed by this project is competency based and utilizes the Ocean County Vocational-Technical Schools' curriculum infused model for the teaching of basic skills as part of vocational education. The design demonstrates the relationship of vocationally related skills to communication, mathematics and science knowledge. Proficiences with regard to student outcomes cannot be achieved without mastery in related academic areas. All student outcome objectives are predicated upon entry level skills which reflect the dictates of the job marketplace and industry. In addition, basic skills matrices developed by the district are included. The totality of this package is designed to facilitate the vocational teaching process and to enchance the learning experiences of our students.

POTENTIAL OPPORTUNITY FOR AWARDING ACADEMIC CREDITS FOR STUDENTS AT OCEAN COUNTY VOCATIONAL-TECHNICAL SCHOOL

450 hours - 1 year course at O.C.V.T.S.
900 hours - 2 year course at O.C.V.T.S.
1000 hours - 2 year Beauty Culture course

120 hours per year needed for 5 credits
60 hours per year needed for 2½ credits

COURSE	TOTAL HOURS	HOURS SPENT ON COMMUNICATION SKILLS	HOURS SPENT ON COMPUTATION SKILLS	HOURS SPENT ON SCIENCE	TIME ON OCCUPATIONAL ACTIVITIES IN CLASS OR SHOP
AIR CONDITIONING, REFRIGERATION AND HEATING	900	140	120	120	520
AUTO BODY REPAIR	900	130	120	125	525
AUTOMOTIVE MECHANICS	900	150	120	120	510
AUTOMOTIVE AND DIESEL ENGINE REBUILDING	900	216	126	125	433
BEAUTY CULTURE I AND II	1000	240	120	130	515
BUILDING TRADES	900	135	120	130	515
BUSINESS RELATIONS - MEDIA/MODELING	450	200	60	40	150
CHILD CARE AIDE	900	240	120	122	418
COMMERCIAL ART AND PRINTING	900	120	215	75	580
COMMERCIAL BUILDING CONSTRUCTION (MASONRY)	900	130	125	130	515

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120 hours per year needed for 5 credits
60 hours per year needed for 2½ credits

COURSE	TOTAL HOURS	HOURS SPENT ON COMMUNICATION SKILLS	HOURS SPENT ON COMPUTATION SKILLS	HOURS SPENT ON SCIENCE	TIME ON OCCUPATIONAL ACTIVITIES IN CLASS OR SHOP
COMMERCIAL PHOTOGRAPHY & TELEVISION PRODUCTION	900	150	125	80	545
CUSTOM CABINETMAKING	900	130	120	60	590
DENTAL ASSISTING	450	168	65	77	140
DESIGN DRAFTING	900	135	150	165	450
ELECTRICAL TRADES	900	106	120	124	550
FASHION MERCHANDISING	450	200	60	40	150
FOOD SERVICES	900	206	132	125	437
INDUSTRIAL AUTOMATION AND ELECTRONICS	900	129	140	132	499
INTERIOR DESIGN	900	210	130	120	440
LANDSCAPING AND GREENHOUSE TECHNOLOGY	900	125	125	175	475

POTENTIAL OPPORTUNITY FOR AWARDING ACADEMIC CREDITS FOR STUDENTS AT OCEAN COUNTY VOCATIONAL-TECHNICAL SCHOOL

450 hours - 1 year course at O.C.V.T.S.
900 hours - 2 year course at O.C.V.T.S.
1000 hours - 2 year Beauty Culture course

120 hours per year needed for 5 credits
60 hours per year needed for 2½ credits

COURSE	TOTAL HOURS	HOURS SPENT ON COMMUNICATION SKILLS	HOURS SPENT ON COMPUTATION SKILLS	HOURS SPENT ON SCIENCE	TIME ON OCCUPATIONAL ACTIVITIES IN CLASS OR SHOP
MARINE ENGINE AND BOAT SERVICES	900	164	120	125	491
MEDICAL OFFICE RECEPTIONIST/ASSISTANT	450	173	60	77	140
MEDICAL SKILLS AND RELATED HEALTH CAREERS	450	135	65	125	125
MEDICAL SKILLS (ADVANCED)	450	125	60	125	140
PLUMBING AND HEATING	900	140	120	120	520
RECREATIONAL VEHICLE MAINTENANCE AND REPAIR	900	125	130	60	585
T.V. AND COMPUTER REPAIR	900	125	150	175	450
WELDING	900	135	120	100	545

COMMUNICATION SKILLS

Listed below are all courses offered at the Ocean County Vocational-Technical School.
The asterisk indicates that the topic is studied in that curriculum.

COURSE	Functional Reading Skills	Vocabulary	Identifying Main Ideas	Meanings in Context	Inferences	Fact/Opinion Distinction	Signal Words	Parts of Text-book/Manual	Following Directions	Outlining and Note Taking	Interpretation of Maps, Graphs and Charts	Interpretation of Diagrams	Test Taking Skills	Expository Writing Skills	Problem Solving	Spelling	Oral Communications	Study Skills	Resume Writing	Job Application Skills
AIR CONDITIONING, REFRIGERATION AND HEATING	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AUTO BODY REPAIR	*	*		*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*
AUTOMOTIVE MECHANICS	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AUTOMOTIVE AND DIESEL ENGINE REBUILDING	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
BEAUTY CULTURE I AND II	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
BUILDING TRADES	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
BUSINESS RELATIONS - MEDIA/MODELING/TRAVEL	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*
CHILD CARE AIDE	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*
COMMERCIAL ART AND PRINTING CAREERS	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
COMMERCIAL BUILDING CONSTRUCTION (MASONRY)	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
COMMERCIAL PHOTOGRAPHY AND TELEVISION PRODUCTION	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
CUSTOM CABINETMAKING	*	*		*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*
DENTAL ASSISTING	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*

COMMUNICATION SKILLS - CONTINUED

COURSE	Functional Reading Skills	Vocabulary	Identifying Main Ideas	Meanings in Context	Inferences	Fact/Opinion Distinction	Signal Words	Parts of Text-book/Manual	Following Directions	Outlining and Note Taking	Interpretation of Maps, Graphs and Charts	Interpretation of Diagrams	Test Taking Skills	Expository Writing Skills	Problem Solving	Spelling	Oral Communications	Study Skills	Resume Writing	Job Application Skills
DESIGN DRAFTING	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
ELECTRICAL TRADES	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
FASHION MERCHANDISING	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*
FOOD SERVICES	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
INDUSTRIAL AUTOMATION AND ELECTRONICS	*	*	*		*	*			*	*	*	*	*	*	*	*	*	*	*	*
INTERIOR DESIGN	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
LANDSCAPING AND GREENHOUSE TECHNOLOGY	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*
MARINE ENGINE AND BOAT SERVICE	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
MEDICAL OFFICE RECEPTIONIST/ASSISTANT	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*
MEDICAL SKILLS AND RELATED HEALTH CAREERS	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
MEDICAL SKILLS (ADVANCED)	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*
PLUMBING AND HEATING	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
RECREATIONAL VEHICLE MAINTENANCE AND REPAIR	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
T.V. AND COMPUTER REPAIR	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
WELDING	*	*	*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

MATHEMATICS SKILLS

Listed below are all courses offered at the Ocean County Vocational-Technical School. The asterisk indicates that the topic is studied in that curriculum.

COURSE	Whole Numbers	Common Fractions	Decimals	Percentages	Weights and Measurements	Ratio and Proportion	Powers and Roots	Formulas	Estimating	Geometry	Basic Trigono-metric Functions	Graphs
AIR CONDITIONING, REFRIGERATION AND HEATING	*	*	*	*	*	*	*	*	*	*	*	*
AUTO BODY REPAIR	*	*	*	*	*	*	*	*	*	*		*
AUTOMOTIVE MECHANICS	*	*	*	*	*	*	*	*	*			*
AUTOMOTIVE AND DIESEL ENGINE REBUILDING	*	*	*	*	*	*	*	*	*	*		*
BEAUTY CULTURE I AND II	*	*	*	*	*	*	*	*	*	*	*	*
BUILDING TRADES	*	*	*	*	*	*	*	*	*	*	*	*
BUSINESS RELATIONS - MEDIA/MODELING/TRAVEL	*		*	*		*			*			*
CHILD CARE AIDE	*	*	*	*	*	*		*	*	*	*	*
COMMERCIAL ART AND PRINTING CAREERS	*	*	*	*	*	*		*	*	*		*
COMMERCIAL BUILDING CONSTRUCTION (MASONRY)	*	*	*	*	*	*	*	*	*	*	*	*
COMMERCIAL PHOTOGRAPHY AND TELEVISION PRODUCTION	*	*	*	*	*	*	*	*	*	*	*	*
CUSTOM CABINETMAKING	*	*	*	*	*	*	*	*	*	*	*	*
DENTAL ASSISTING	*	*	*	*	*	*		*	*			*

MATHEMATICS SKILLS - CONTINUED

COURSE	Whole Numbers	Common Fractions	Decimals	Percentages	Weights and Measurements	Ratio and Proportion	Powers and Roots	Formulas	Estimating	Geometry	Basic Trigonometric Functions	Graphs
DESIGN DRAFTING	*	*	*	*	*	*		*	*	*	*	*
ELECTRICAL TRADES	*	*	*	*	*	*	*	*	*	*	*	*
FASHION MERCHANDISING	*	*	*	*	*	*		*	*	*		*
FOOD SERVICES	*	*	*	*	*	*		*	*	*		*
INDUSTRIAL AUTOMATION AND ELECTRONICS	*	*	*	*	*	*		*	*	*	*	*
INTERIOR DESIGN	*	*	*	*	*	*		*	*	*		*
LANDSCAPING AND GREENHOUSE TECHNOLOGY	*	*	*	*	*	*		*	*	*	*	*
MARINE ENGINE AND BOAT SERVICE	*	*	*	*	*	*		*			*	*
MEDICAL OFFICE RECEPTIONIST/ASSISTANT	*	*	*	*	*	*	*	*	*	*		*
MEDICAL SKILLS AND RELATED HEALTH CAREERS	*	*	*	*	*	*		*	*	*	*	*
MEDICAL SKILLS (ADVANCED)	*	*	*	*	*	*		*	*	*	*	*
PLUMBING AND HEATING	*	*	*	*	*	*	*	*	*	*	*	*
RECREATIONAL VEHICLE MAINTENANCE AND REPAIR	*	*	*	*	*	*	*	*			*	*
T.V. AND COMPUTER REPAIR	*	*	*	*	*	*	*	*		*	*	*
WELDING	*	*	*	*	*	*		*	*	*	*	*

SCIENCE SKILLS

Listed below are all courses offered at the Ocean County Vocational-Technical School. Those listed as "Not Available" do not offer enough hours to qualify for credits in your high school. However, we have noted the skills covered. Those listed with an asterisk after the title are eligible. The asterisk indicates that the topic is studied in that curriculum.

	HUMAN ANATOMY						ASTRONOMY			CHEMISTRY			PHYSICS					ECOLOGY				
COURSE	Cellular Theory	Skeletal System	Muscles	System of Body	Diseases	Psychology	Solar System	Gravity	Weather	Matter	Chemical Reactions	Applied Chemistry	Light	Magnetism	Heat	Magnetism and Electricity	Nuclear Energy	Botany	Food Production	Fuels	Nutrition	Waste Disposal
AIR CONDITIONING, REFRIGERATION AND HEATING							*	*	*	*	*	*		*	*	*				*	*	
AUTO BODY REPAIR								*	*	*	*	*	*	*	*					*		*
AUTOMOTIVE MECHANICS								*		*	*	*	*	*	*	*				*		
AUTOMOTIVE DIESEL AND ENGINE REBUILDING								*		*	*	*		*	*	*	*			*		*
BEAUTY CULTURE I AND II	*	*	*	*	*	*				*	*	*	*		*	*					*	
BUILDING TRADES							*	*	*	*	*	*	*		*	*		*		*		
BUSINESS RELATIONS - MEDIA/MODELING/TRAVEL	N	* O	* T	* A	V	* A	I	L	A	B	L	E										
CHILD CARE AIDE	*	*	*	*	*	*			*		*	*		*	*			*	*		*	*
COMMERCIAL ART AND PRINTING CAREERS	N	O	T	A	V	A	I	* L	A	* B	* L	* E	*		*	*						*
COMMERCIAL BUILDING CONSTRUCTION (MASONRY)	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*		*		*	*	*
COMMERCIAL PHOTOGRAPHY AND TELEVISION PRODUCTION	N	O	T	A	V	* A	I	* L	A	* B	* L	* E	*		*	*						*
CUSTOM CABINETMAKING	* N	O	T	A	V	A	I	* L	A	* B	* L	* E			*			*				
DENTAL ASSISTING	*	*	*	*	*	*				*	*	*	*								*	*

SCIENCE SKILLS - CONTINUED

COURSE	HUMAN ANATOMY						ASTRONOMY			CHEMISTRY			PHYSICS					ECOLOGY				
	Cellular Theory	Skeletal System	Muscles	System of Body	Diseases	Psychology	Solar System	Gravity	Weather	Matter	Chemical Reactions	Applied Chemistry	Light	Magnetism	Heat	Magnetism and Electricity	Nuclear Energy	Botany	Food Production	Fuels	Nutrition	Waste Disposal
DESIGN DRAFTING							*	*	*	*		*	*		*	*	*			*		*
ELECTRICAL TRADES							*	*	*	*	*		*	*	*	*	*		*			
FASHION MERCHANDISING	*	*	*	*		*		*		*	*	*	*								*	
FOOD SERVICES					*	*		*	*		*	*	*		*				*		*	*
INDUSTRIAL AUTOMATION AND ELECTRONICS								*		*			*	*	*	*	*			*		
INTERIOR DESIGN		*	*			*	*	*	*	*	*	*	*		*	*						
LANDSCAPING AND GREENHOUSE TECHNOLOGY							*	*	*		*	*	*		*	*		*	*	*	*	*
MARINE ENGINE AND BOAT SERVICE								*	*	*	*	*	*	*	*	*		*		*		
MEDICAL OFFICE RECEPTIONIST/ASSISTANT	N	* O	* T	* A	* V	* A	I	L	A	B	* L	E										*
MEDICAL SKILLS AND RELATED HEALTH CAREERS	*	*	*	*	*	*		*		*	*					*			*		*	*
MEDICAL SKILLS (ADVANCED)	*	*	*	*	*	*		*		*	*					*			*		*	*
PLUMBING AND HEATING					*		*	*	*	*	*	*			*	*		*		*		*
RECREATIONAL VEHICLE MAINTENANCE AND REPAIR	N	O	T	A	V	A	I	* L	A	* B	* L	* E	*	*	*	*				*		*
T.V. AND COMPUTER REPAIR										*	*	*	*	*	*	*				*		
WELDING								*		*	*	*	*	*	*	*				*		

COURSE OBJECTIVES

1. To prepare students with entry level skills, abilities and knowledge for employment in the automotive mechanics trades.

2. To present 900 hours of instruction and practice in the automotive mechanics trades in accordance with the course curriculum and skill profile outline.

3. To provide a detailed summary evaluation of the proficiency achieved by each student representing the most important content areas presented in the automotive mechanics skill profile.

4. To help each student develop positive attitudes and ideals related to their occupation in the automotive mechanics trades and understand their own capabilities and potential.

5. To instill in each student the need to plan for their professional growth through continuous learning in their chosen occupation.

STUDENT ACTIVITIES

All students enrolled in the Ocean County Vocational-Technical School are encouraged to join Vocational Industrial Clubs of America (VICA). Student activities are infused into each program. Each building has a student government and a student activities program separate from VICA. Additionally, students from each center and every class are encouraged to participated in the VICA Leadership and Job Demonstration Contests which begin in the centers and radiate throughout the district as Ocean County Vocational-Technical School inter school winners are chosen.

Student activities emphasize the basic precepts of VICA, as well as the basic tenets of democracy. Within the context, each of our programs teaches the dignity of work, high standards in trade ethics and safety, and a belief in the free enterprise economic system.

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UNIT: CAREER ORIENTATION

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Explain why the need for automotive service is increasing II. Identify major types of automotive businesses	A. Automobile service needs are increasing due to several factors, among which are the increasing complexity of the technology involved, the increased average age of vehicles, and the need to meet the needs of fuel economy and emission B. There are many major types of businesses that are engaged in meeting the needs of the industry. They include firms involved in the manufacturing, sales, and service of automobiles	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Test taking skills E. Writing skills F. Spelling G. Oral communication H. Study skills			Student will be able to demonstrate a knowledge of the reasons for the increasing needs in the automotive service industry, as well as, be able to describe the major types of automotive service businesses that are meeting those needs
III. Identify the wide variety of jobs available in the automotive industry IV. Describe the duties of general and specialty mechanics	A. There is a wide variety of jobs in the automotive industry. These include jobs for general mechanics and mechanics that work only in specialized areas B. Other job opportunities exist in such areas as shop foreman, service manager, service writer, and parts department, to name only a few	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Outlining and note taking E. Test taking skills F. Writing skills G. Spelling H. Oral communication I. Study skills			Student will be able to demonstrate a knowledge of job opportunities in the automotive field and the skills required for those positions by passing a written test

UNIT: FASTENERS

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Identify the various types of automotive fasteners and their functions	A. There are many types of fasteners with specific and limited functions B. It is necessary to properly identify these fasteners, their functions, capabilities and limitations	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Whole numbers B. Common fractions C. Metric conversion D. Torque	Metallurgy 1. The student must have a working knowledge of the different types of steel and other materials used in automotive fasteners, so a fastener that is needed in a critical location is of the proper tensile strength 2. Different metals react to each other in different ways - A mechanic must be aware of this	Student should be able to demonstrate identification of common fasteners by passing a written test

UNIT: MEASUREMENT

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Demonstrate a knowledge of metric and standard systems of measurement and properly use common measuring devices	Use of various measuring devices accurately is necessary to determine critical dimensions when performing many repair operations on an automobile	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts ot textbook/ manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Problem solving J. Spelling K. Oral communication L. Study skills	A. Whole numbers B. Common fractions C. Decimals D. Weights and measurement E. Ratio and proportion F. Metric conversion		Student will demonstrate an ability to properly and accurately use various types of measuring devices as determined by passing a written and performance test

UNIT: SAFETY

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Demonstrate a knowledge of safe working habits, attitude and proper shop procedure	A. Knowledge of shop layout B. Location of safety devices C. Fire drill procedures and exits D. Identification of hazards in the work area	A. Functional reading skills B. Vocabulary C. Signal words D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Spelling J. Oral communication K. Study skills		A. Chemical reactions B. Heat C. Fuels D. Waste disposal	A. Student will demonstrate an ability to perform in a manner that will protect him or herself and others in the shop B. Student will be required to pass a written test with a score of 100
II. Proper use of hand tools	A. Proper selection of the correct hand tool for the job B. Safe and correct use of that tool	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Problem solving K. Spelling L. Oral communication M. Study skills	A. Whole numbers B. Common fractions C. Metric conversion D. Torque		A. Student will display sufficient knowledge of proper hand tool use by passing a performance test

UNIT: SAFETY - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
III. Safe and proper use of jacks, hoists, and jackstands	Proper procedure in using various types of lifting and support devices is essential to protect students and equipment	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Problem solving K. Spelling L. Oral communication M. Study skills	Weights and measurement	A. Many of the tools and equipment in the auto shop operate on the principles of pneumatics, compressed air, and hydraulics, compressed liquids B. A basic knowledge of these principles is important to the safe operation of shop equipment	Student will demonstrate a knowledge of safe and proper use of lifting equipment by passing a performance test

UNIT: TIRES

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Describe the purpose of tires on an automobile	Tires have two purposes 1. They absorb shocks of the road 2. They grip the road to provide good traction	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Outlining and note taking E. Test taking skills F. Writing skills G. Spelling H. Oral communication I. Study skills		A. Friction B. Heat Tires have a certain amount of what is known as rolling resistance as the vehicle is moving. This generates friction, which, in turn, causes heat build up in the tire. This can affect the handling ability of the tire to a certain extent depending on tire design and construction	Student will be able to demonstrate a knowledge of the purpose of tires by passing a written test
II. Describe the basic components of the tire and its construction Differentiate between radial ply and bias ply construction	A. Tires are constructed in different ways to meet different applications B. Radial tires differ significantly in their basic construction from bias ply tires C. Radial ply and bias ply tires are not compatible on the same vehicle	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Spelling J. Oral communication K. Study skills		A. Friction B. Heat Tires have a certain amount of what is known as rolling resistance as the vehicle is moving. This generates friction, which, in turn, causes heat build up in the tire. This can affect the handling ability of the tire to a certain extent depending on tire design and construction	Student will be familiar with basic tire construction and be able to differentiate between radial and bias ply tires as demonstrated by passing a written test

UNIT: TIRES - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
III. Identify tire size markings and load range codes on a tire	A. There are different tire size marking systems in use, the most common of which are the alph-numeric system and the metric system B. It is necessary to not only interpret correct tire size but also load carrying ability	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Problem solving K. Spelling L. Oral communication M. Study skills	A. Whole numbers B. Decimals C. Percentages D. Weights and measurement E. Ratio and proportion		Student will demonstrate an ability to interpret tire size and load range markings on automobile tires by passing a written test
IV. Interpret the codes for the Uniform Tire Quality Grading System	The Uniform Tire Quality Grading System rates tires in three areas 1. Treadwear 2. Wet weather traction 3. Temperature (heat dissipation)	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Problem solving K. Spelling L. Oral communication M. Study skills	A. Whole numbers B. Ratio and proportion	A. Friction B. Heat Tires have a certain amount of what is known as rolling resistance as the vehicle is moving. This generates friction, which, in turn, causes heat build up in the tire. This can affect the handling ability of the tire to a certain extent depending on tire design and construction	Student will demonstrate an ability to interpret the Uniform Tire Quality Grading System by passing a written test

UNIT: TIRES - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
V. Rotate tires on an automobile	A. The amount of wear a tire gets depends on its location on the car - Periodically changing the position of tires on a vehicle will increase their life B. There are different rotation patterns that are used in different situations	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/ manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Spelling J. Oral communication K. Study skills			A. Student will be able to display a working knowledge of tire rotation patterns and reasons for doing so by passing a written test B. The student's ability to perform a tire rotation will be demonstrated by achieving a moderate level of skill on a performance test
VI. Identify common tire wear patterns	Tires can wear abnormally for a variety of reasons 1. Overinflation 2. Underinflation 3. Worn suspension components 4. Poor driving habits	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/ manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Problem solving J. Spelling K. Oral communication L. Study skills	Geometry	Friction	Student will be given the opportunity to demonstrate his/her ability to interpret tire wear patterns by achieving a moderate level of skill on a performance test

UNIT: TIRES - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
VII. Remove and replace a tire from a wheel using the Coats 10/10 Tire Changer	Tires must be removed from wheels for a variety of reasons 1. Effect a tire repair 2. Replace the tire	A. Functional reading skills B. Vocabulary C. Signal words D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Spelling J. Oral communication K. Study skills		Pneumatics	Student will demonstrate knowledge of safe and proper procedure by passing a written test and achieving a moderate level of skill on a performance test
VIII. Static balance a wheel and tire assembly	A. Static imbalance causes a condition known as wheel tramp, due to the fact that one section of the wheel and tire assembly is out of balance with another section B. A bubble balancer is used for this procedure	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communications K. Study skills	A. Whole numbers B. Common fractions C. Decimals D. Weights and measurements		Student will demonstrate a knowledge of the cause and effects of static imbalance by passing a written test and actual ability by achieving a moderate level of skill on a performance test

UNIT: TIRES - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
IX. Dynamic balance a tire and wheel assembly	Dynamic imbalance causes a condition known as wheel shimmy because one side of the tire and wheel assembly is out of balance with the other side	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Whole numbers B. Common fractions C. Decimals D. Weights and measurement		Student will demonstrate a knowledge of the cause and effects of dynamic imbalance by passing a written test and actual ability by achieving a moderate level of skill on a performance test
X. Effect a temporary repair on a bias ply tire using a plug	A. Repairing a puncture in a tire using a plug is considered a temporary repair only B. It is not advisable to use this method of repair on a radial ply tire	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Spelling J. Oral communication K. Study skills		Chemical reactions The adhesive compound that is used actually causes the two materials to bond to each other	Student will demonstrate a knowledge of proper practice and procedures by both written and performance testing

UNIT: TIRES - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XI. Repair a puncture in a radial ply tire using a radial tire patch	A. Radial tires require a more effective method of repair due to the constructional design of the tire B. A special radial tire patch is recommended	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/ manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Problem solving J. Spelling K. Oral communication L. Study skills		Chemical reactions The adhesive compound that is used actually causes the two materials to bond to each other	Student will demonstrate a knowledge of repairing a radial ply tire by passing a written test and by achieving a moderate level of skill on a performance test

UNIT: LUBRICATION

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Describe the function of motor oil and the operation of the lubrication system of an automobile engine	The engine lubrication system provides lubrication oil for all parts that move or contact other parts within the engine	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/ manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Problem solving K. Spelling L. Oral communication M. Study skills	A. Whole numbers B. Common fractions C. Decimals D. Percentages	A. Chemical reactions B. Heat C. Friction D. Fuels E. Many chemical reactions take place in an engine during the combustion of a hydrocarbon fuel F. Oil is not only responsible for reducing friction between moving parts, but also for carrying away as much as 1/3 the heat produced by the engine	Student should be able to identify the functions a motor oil must perform within an engine by passing a written test
II. Identify the parts of an automobile engine lubrication system and describe their operation	The lubrication system consist of several parts that function together to provide proper engine lubrication	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/ Manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Spelling J. Oral communications K. Study skills	Weights and measurement	A. Chemical reactions B. Heat C. Friction D. Fuels E. Many chemical reactions take place in an engine during the combustion of a hydrocarbon fuel F. Oil is not only responsible for reducing friction between moving parts, but also for carrying away as much as 1/3 the heat produced by the engine	Student will be able to demonstrate an ability to identify and describe the function of each of the components of the lubrication system by passing a written test

UNIT: LUBRICATION - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
III. Identify and explain the SAE and API service ratings for engine oils	Engine oil is rated according to certain standards based upon the additives it contains and the applications it was designed for	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Problem solving K. Spelling L. Oral communication M. Study skills	A. Ratio and proportion B. Measurement C. Percentages	A. Chemical reactions B. Friction C. Heat D. Many chemical reactions take place in an engine during the combustion of a hydrocarbon fuel E. Oil is not only responsible for reducing friction between moving parts, but also for carrying away as much as 1/3 the heat produced by the engine	Student should be able to accurately identify the SAE and API codes and determine proper applications of various engine oils by passing a written test
IV. Perform a chassis lubrication on an automobile	There are many components of a vehicle's suspension that require periodic lubrication to provide proper operation and to minimize wear	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Whole numbers B. Common fractions C. Measurement		Student will demonstrate moderate skill in chassis lubrication by passing a performance test

UNIT: LUBRICATION - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
V. Perform lubrication service by doing an oil and filter change on an automobile engine	Due to many reasons, oil deteriorates over a period of time and must be replaced	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Whole numbers B. Common fractions C. Decimals D. Weights and measurement	A. Chemical reactions B. Fuels C. Heat D. Friction E. Many chemical reactions take place in an engine during the combustion of a hydrocarbon fuel F. Oil is not only responsible for reducing friction between moving parts, but also for carrying away as much as 1/3 the heat produced by the engine G. Waste disposal H. A large percentage of the contents in a quart of modern engine oil is chemical additives to give the oil certain characteristics, including 1. Detergent-dispersants 2. Viscosity improvers 3. Anti-foam agents I. While the oil itself does not deteriorate, the protective ability of the additives do wear out	Student will be able to perform an oil and filter change as demonstrated by a performance test

UNIT: COOLING SYSTEM

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Describe the purpose and the operation of an automobile cooling system	An internal combustion engine produces a great amount of heat which must be carried away by the cooling system in order to insure proper engine operation	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/ manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Problem solving K. Spelling L. Oral communication M. Study skills	A. Whole numbers B. Percentages	Heat An internal combustion engine produces a great amount of heat which must be carried away by the cooling system in order to insure proper engine operation	Student will demonstrate a knowledge of cooling system operation by passing a written test
II. Describe the function and operation of the individual components of the cooling system	There are several individual components of the automobile engine cooling system that operate together to provide efficient engine cooling	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/ manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Problem solving K. Spelling L. Oral communication M. Study skills	A. Whole numbers B. Percentages	Heat An internal combustion engine produces a great amount of heat which must be carried away by the cooling system in order to insure proper engine operation	Student will be able to identify the components of an automobile engine cooling system as demonstrated by passing a written test

UNIT: COOLING SYSTEM - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
III. Pressure test a cooling system and radiator pressure cap	A. Automotive cooling systems operate at higher than atmospheric pressure B. The system must be able to withstand this pressure or system failure will result	A. Functional reading skills B. Vocabulary C. Signal words D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Problem solving J. Spelling K. Oral communication L. Study skills	A. Whole numbers B. Decimals	A. Heat B. Atmospheric pressure 1. Water boils at 212^{o} Fahrenheit at sea level where atmospheric pressure is 14.7 psi 2. For every pound of pressure above that at sea level, the boiling point of water is raised 3^{o} 3. Cooling systems are pressurized to ensure the coolant will remain a liquid, enabling it to still carry away heat without turning to steam, which cannot carry away heat	Student will perform a cooling system pressure test with a moderate degree of skill as demonstrated by a performance test
IV. Inspect all components of the cooling system for proper operation	A. The components of an automotive cooling system eventually experience wear which will render them inoperable B. Periodic inspection is necessary to maintain proper system operation	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Spelling K. Oral communication L. Study skills			Student will be able to inspect components of a cooling system for wear as indicated by a performance test

UNIT: COOLING SYSTEM - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
V. Drain and flush automobile engine cooling system and refill with proper mixture of anti-freeze and water	A. An automobile engine cooling system must be periodically drained and flushed to remove dirt, scale, and corrosion B. This will help to maintain proper cooling system efficiency	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Whole numbers B. Common fractions C. Percentages D. Weights and measurement E. Ratio and proportion	Chemical reactions 1. Coolant is a mixture of antifreeze and water 2. Antifreeze contains ethylene glycol and anti-corrosion agents which wear out 3. Pure water will allow the formation of rust and can also cause impurities and electrolysis as a result of two or more dissimilar metals in the presence of water 4. The system must be periodically flushed to prevent this	Student will be able to perform a cooling system flush and refill with a moderate degree of skill as demonstrated by passing a performance test
VI. Check strength of anti-freeze in an automotive cooling system by testing with a hydrometer	There must be a sufficient amount of anti-freeze in the coolant of an engine's cooling system to prevent damage from freezing temperatures	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Whole numbers B. Ratio and proportion C. Percentages D. Weights and measurement	Specific gravity 1. The relative density of a material when compared to density of water, which has a specific gravity of 1 2. By testing the specific gravity of the coolant with a hydrometer, it can be determined the amount of anti-freeze in the coolant, and, thus, its freezing point	Student should be able to show a knowledge of proper test procedure and the theory of specific gravity as demonstrated by a written test and a performance test

UNIT: COOLING SYSTEM - CONTINUED

TOPIC:

	TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
VII.	Remove and replace thermostat Refill and pressure test system	A. The cooling system thermostat regulates the temperature at which coolant flows through an engine B. Proper temperature control is essential to the proper operation of the engine	A. Functional reading skills B. Vocabulary C. Signal words D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Problem solving J. Spelling K. Oral communication L. Study skills	A. Whole numbers B. Common fractions C. Ratio and proportion D. Measurement	Heat An internal comustion engine produces a great amount of heat which must be carried away by the cooling system in order to insure proper engine operation	Student will demonstrate a knowledge of cooling system operation by passing a written test

UNIT: BATTERY SERVICE

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Work safely around automotive batteries	A. Batteries contain electrolyte, which is part of sulfuric acid B. Batteries produce hydrogen gas, which is highly flammable	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Problem solving K. Spelling L. Oral communication M. Study skills	A. Percentages B. Ratio and proportion	Chemical reactions 1. Sulfuric acid is a highly corrosive substance which can cause severe damage to the skin and eyes 2. Hydrogen gas, produced by the battery, is extremely explosive and nothing should be used around a battery that could ignite it	Student will demonstrate a knowledge of battery hazards by passing a written test
II. Describe how an automobile battery operates and its function in an automobile electrical system	An automotive battery produces electricity on demand due to the electro chemical action of two dissimilar metals in the presence of an acid	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Problem solving K. Spelling L. Oral communication M. Study skills	Ratio and proportion	A. Chemical reactions B. Electricity An automotive battery produces electricity on demand due to the electro chemical action of two dissimilar metals in the presence of an acid	Student will demonstrate a knowledge of battery operation by passing a written test

UNIT: BATTERY SERVICE - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
III. Perform routine maintenance on an automotive battery Clean terminals and posts Clean battery case with baking soda	A. Corrosion and oxidation on battery terminals and posts cause resistance which impedes normal current flow B. Dirt and acid accumulation on the battery case can cause the battery to self-discharge - Baking soda neutralizes this build up	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Spelling J. Oral communication K. Study skills		A. Chemical reactions B. Electricity (See theory)	Student will be able to perform routine battery maintenance procedures as demonstrated by passing a performance test
IV. Perform a hydrometer test on the cells of an automotive battery	A hydrometer measures the specific gravity of the electrolyte in each battery cell which indicates the percentage of sulfuric acid content, thus indicating the state of charge of battery	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Whole numbers B. Decimals C. Percentages	A. Chemical reactions The amount of sulfuric acid in the electrolyte of a battery can determine its state of charge B. Heat The temperature of the battery electrolyte when it is tested with a hydrometer will affect the results of the reading	A. Student should be able to determine the state of charge of an automotive battery by conducting a hydrometer test B. Knowledge and skill will be demonstrated by a written and performance test

UNIT: BATTERY SERVICE - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
V. Perform a fifteen second capacity test on an automotive battery (load test)	A load or current draw is placed upon the battery which simulates normal starter current draw to determine if the battery can convert chemical energy into electrical energy quickly enough to supply the needs of the starting system	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Whole numbers B. Decimals C. Measurement	Chemical reactions (See theory)	Student will demonstrate a knowledge of the theory involved by passing a written test and actual ability by achieving a moderate level of skill on a performance test
VI. Properly and safely charge a discharge battery using the shop battery charger	A. Occasionally, a battery will have to be recharged using a battery charger B. Safe and proper procedure must be followed to prevent injury to the operator or damage to the battery	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Whole numbers B. Decimals C. Measurement	A. Chemical reactions Production of explosive hydrogen gas B. Electricity Choice of proper charging rate	Student will demonstrate a knowledge of safe and proper procedure by passing a written test and by achieving a moderate level of skill on a performance test

UNIT: BATTERY SERVICE - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
VII. Perform a three minute charge test on a battery suspected of being sulphated	If a battery has failed the fifteen second capacity test, the three minute charge test can be performed to determine if the battery plates are coated with lead sulphate to such a degree that the battery should be destroyed	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Whole numbers B. Decimals	A. Chemical reactions Due to a variety of conditions, the plates of a battery may become coated with a crystalline substance called lead sulphate which will cause the battery to not be able to convert chemical energy to electrical energy quickly enough to supply the needs of the starting system B. Electricity (See theory)	Student will demonstrate a knowledge of safe and proper procedure and theory by passing a written test and will demonstrate actual ability by achieving a moderate skill level on a performance test
VIII. Safely jump start a vehicle with a "dead" battery	Proper connection of jumper cables is necessary to prevent injury and damage to the vehicle's electrical system	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/ manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Spelling J. Oral communication K. Study skills		All elements of battery operation, theory, and safety as stated in previous tasks	Student will demonstrate a knowledge of correct jump-starting procedure by passing a written and performance test

UNIT: ELECTRICAL SYSTEMS

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Define voltage Define amperage Defing resistance	A. Voltage 1. Electrical pressure 2. Unit of measurement is the volt B. Amperage 1. Measurement of current flow through a conductor 2. Unit of measurement is the ampere C. Resistance 1. Opposition to electron flow in a conductor 2. Unit of measurement is the ohm	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Whole numbers B. Decimals C. Measurement	A. Voltage B. Amperage C. Resistance (See theory)	Student will demonstrate a knowledge of basic electrical theory by passing a written test

UNIT: ELECTRICAL SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
II. Use Ohm's Law to determine electrical values	A. There is a definite relationship between current, voltage, and resistance B. Ohm's Law is an algebraic formula to determine an unknown value when two of the three values are known C. Voltage is equal to amperage x Ohms, or E=IR 1. E = voltage 2. I = current 3. R = resistance	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Whole numbers B. Common fractions C. Decimals D. Measurement E. Algebra F. Formulas	Electricity (See theory)	Student will demonstrate proficiency in the use of Ohms law by using it in automobile problems on a written test
III. Describe the manner in which magnetism plays such an important part in so many of an automobile's electrical systems	A. Magnetism produces electricity and electricity produces magnetism B. An understanding of this principle is essential to understanding how many of the electrical components in an automobile function	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills		A. Magnetism B. Electricity (See theory)	Student will demonstrate a basic understanding of magnetic theory by passing a written test

UNIT: STARTING SYSTEMS

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Explain how a starter motor operates	Electromagnetism supplies the turn-force, or torque, is used to turn the starter pinion gear	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	Torque	A. Magnetism B. Electricity Magnetism produces electricity and electricity produces magnetism An understanding of this principle is essential to understand how many of the electrical components in an automobile function	Student will demonstrate a knowledge of starter motor principles by passing a written test
II. Identify and describe the basic parts of a starter motor	The starter motor is comprised of many parts which provide power to start the engine 1. Field frame 2. Pole shoes 3. Brushes 4. Assembly 5. Armature 6. Pinion gear	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	Torque	A. Magnetism B. Electricity Magnetism produces electricity and electricity produces magnetism An understanding of this principle is essential to understand how many of the electrical components in an automobile function	Student will be able to identify the components of a starter system and describe their operation as demonstrated by a written and performance test

UNIT: STARTING SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
III. Locate visible parts of a vehicles starting system	An automobile starting system includes several components 1. Cables 2. Motor solenoid 3. Battery 4. Ignition switch 5. Starter relay	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Spelling J. Oral communication K. Study skills		A. Magnetism B. Electricity Magnetism produces electricity and electricity produces magnetism An understanding of this principle is essential to understand how many of the electrical components in an automobile function	Student will be able to identify the major components of a starting system by passing a written and performance test
IV. Perform starter current draw test	A. A starter in proper operating condition draws a certain amount of current depending upon engine size and several other factors B. A starter current draw test determines exactly how much current a starter is drawing	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	Common fractions	A. Magnetism B. Electricity Magnetism produces electricity and electricity produces magnetism An understanding of this principle is essential to understand how many of the electrical components in an automobile function	Student will be able to perform a starter draw test with a moderate degree of skill as determined by a performance test

UNIT: STARTING SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
V. Perform an armature growler test	A. Starter motor armatures sometimes develop short circuits within their windings B. An armature growler test is used to determine the condition of a starter motor armature	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills		A. Magnetism B. Electricity Magnetism produces electricity and electricity produces magnetism An understanding of this principle is essential to understand how many of the electrical components in an automobile function	A. Student will perform an armature growler test to determine the condition of an armature B. Student will demonstrate a moderate level of skill on a performance test
VI. Remove and replace starter motor on an automobile	A. The greatest problem in removing a starter motor is gaining access to it B. In some cases, suspension components, exhaust manifolds, etc., must be removed	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Oral communication G. Study skills			Student will demonstrate ability to remove and replace starter motor on a vehicle by achieving a moderate degree of skill on a performance test

UNIT: STARTING SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
VII. Perform trouble-shooting procedure on a starting system	Several starting system tests can be performed with the starter installed in the automobile 1. Battery tests 2. Starter current draw tests 3. Voltage drop tests 4. Visual inspection of system components	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Interpretation charts G. Test taking skills H. Writing skills I. Problem solving J. Spelling K. Oral communication L. Study skills	A. Decimals B. Whole numbers	A. Magnetism B. Electricity Magnetism produces electricity and electricity produces magnetism An understanding of this principle is essential to understand how many of the electrical components in an automobile function	Student will demonstrate ability to diagnose common starter system problems by passing a written test and by performing trouble-shooting procedures on vehicles

UNIT: CHARGING SYSTEMS

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Identify and describe the parts of a charging system	A typical charging system consists of the following 1. Alternator 2. Voltage regulator 3. Charging indicator 4. Wiring connections	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Problem solving K. Spelling L. Oral communication M. Study skills		A. Magnetism B. Electricity Magnetism produces electricity and electricity produces magnetism An understanding of this principle is essential to understanding how many of the electrical components in an automobile function	Student will be able to identify the components of a charging system as indicated by a written and performance test
II. Explain how AC current is changed to DC current in an alternator	A. An alternator produces alternating electrical current when powered by a belt driven by engine power B. The AC is rectified, or changed to direct current (DC) by diodes, for use in the automobile's electrical system	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Oral communication I. Study skills J. Spelling skills		Electricity 1. AC current is rectified, or changed to DC current by the use of diodes 2. Diodes are electrical devices that allow current flow in one way only, thus allowing only direct current flow	Student will demonstrate a knowledge of alternator function by passing a written test

UNIT: CHARGING SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
III. Explain the operation of a voltage regulator	A. A voltage regulator is a device that monitors the electrical systems voltage level B. It switches current on and off to the rotor field on the alternator to regulate current output	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	Whole numbers	A. Electricity (See theory) B. Magnetism and electricity	Student will demonstrate a knowledge of voltage regulator operation by passing a written test
IV. Disassemble and reassemble an alternator and describe the operation of the components	A. An alternator consists of a rotating magnet within a coil B. As the magnet is rotated, its lines of magnetic force pass through the coil, inducing current flow	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		Magnetism and electricity (See theory)	Student will be able to disassemble an alternator, identify its components, and describe their function as demonstrated by a performance test

UNIT: CHARGING SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
V. Identify and describe the causes of overcharging and undercharging	A. Various problems in the charging circuit can cause overcharging or undercharging conditions B. The student must know the common causes of these conditions 1. Faulty components 2. Loose drive belts 3. Poor wiring connections 4. etc.	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Whole numbers B. Common fractions C. Decimals	A. Magnetism B. Electricity Various problems in the charging circuit can cause overcharging or undercharging conditions	Student will be able to demonstrate a knowledge of the common causes of overcharging and undercharging by passing a written test
VI. Perform charging system preventive maintenance	Routine charging system preventive maintenance includes the following procedures 1. Check charging system indicators and battery charge 2. Check drive belts 3. Check wiring connections 4. Visually inspect alternator and regulator	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		A. Magnetism B. Magnetism and electricity Various problems in the charging circuit can cause overcharging or undercharging conditions	Student will demonstrate an ability to perform charging system preventive maintenance by passing a performance test

UNIT: CHARGING SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
VII. Perform a charging system voltage/ alternator output test	A. To isolate the cause of undercharging or overcharging, two tests are performed 1. Charging voltage test 2. Alternator output test B. These tests will indicate if the charging system is operating properly by determining the voltage and amperage output of the system	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Whole numbers B. Common fractions C. Decimals D. Measurement	Electricity 1. Voltage 2. Amperage 3. Resistance	Student will demonstrate an ability to perform alternator charging voltage test and alternator output test by passing a performance test with a moderate degree of skill
VIII. Remove and replace alternator on an automobile	Alternator failure may require replacement of the unit	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills			Student will demonstrate ability to remove and replace an alternator by passing a performance test with a moderate degree of skill

UNIT: BRAKE SYSTEM

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Explain how friction is used to stop an automobile	A. A brake is a device that uses friction to slow or stop a mechanism B. Friction is an action that is caused when two parts rub against one another and resist motion	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		A. Friction (see theory) B. Heat-friction causes heat - Heat produces wear which the brake system components must be able to withstand	Student will be able to demonstrate a knowledge of friction by passing a written test
II. Identify the parts of a basic brake system	A basic brake system is composed of the following components 1. Brake fluid 2. Master cylinder 3. Brake lines 4. Wheel cylinders 5. Stop light switch 6. Friction materials	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		A. Heat B. Friction	Student will be able to describe the parts of a basic brake system and explain their function as demonstrated by passing a written test

UNIT: BRAKE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
III. Describe the differences between disc and drum brakes	A. Brake assemblies are described according to the design of their braking, or friction producing parts B. On an automobile, brake systems usually are referred to as disc brakes or drum brakes C. A disc brake stops an automobile through action on a disc D. A drum brake stops an automobile through action on a drum	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		A. Heat B. Friction	Student will be able to differentiate disc brake systems from drum brake systems by passing a written test
IV. Identify the valves in a disc and drum brake combination	A. Many automobiles use a combination of brake systems B. Disc brakes are usually located at the front wheels and drum brakes at the rear wheels C. Since the two brake systems operate differently, control valves are used for proper braking action	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing H. Spelling I. Oral communication J. Study skills		A. Heat B. Friction	Student will be able to describe the operation of the control valves of a combination disc-drum braking system by passing a written test

UNIT: BRAKE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
V. Describe the operation of a power brake system	A. Power brakes are provided by adding power brake booster between the firewall and the master cylinder B. The unit boosts pedal pressure, reducing the amount of effort by the driver during braking	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		A. Heat B. Friction	Student will be able to describe the operation of a power brake unit by passing a written test
VI. Describe the characteristics of brake fluid and the rating system used to define its application and use	A. Temperatures in braking systems vary considerably B. The fluid in a brake hydraulic system must be able to withstand these temperature changes and not corrode the parts C. The DOT (Department of Transportation) rates brake fluid according to certain characteristics D. Only DOT 3 brake fluid or higher should be used in an automotive braking system	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Spelling K. Oral communication L. Study skills		Chemical reactions 1. Brake fluid must be able to withstand extreme temperatures without boiling 2. It also has the ability to absorb moisture in the system or from the air 3. Brake fluid should have minimal exposure to air, or it becomes contaminated and should not be used	Student will be able to describe the characteristics of brake fluid by passing a written test

UNIT: BRAKE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
VII. Differentiate between a fixed caliper and a floating caliper	Caliper designs are of two basic types 1. Fixed caliper 2. Floating caliper	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		A. Heat B. Friction	Student will be able to differentiate a fixed caliper design from a floating caliper design by achieving a moderate degree of skill on a performance test
VIII. Differentiate servo brakes from non-servo brakes	A. When brake shoes begin to rotate they contact the drum; a self-energizing action takes place B. Servo action means that a drum brake assembly increases braking performance by its own actions C. Less pedal effort is required by the driver D. Non-servo brakes are anchored at the bottom of the brake assembly; servo brakes are not	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		A. Heat B. Friction	Student will be able to tell the difference between servo and non-servo brake systems by achieving a moderate score on a performance test

UNIT: BRAKE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
IX. Describe the principle of hydraulics as applied to the automotive braking system	A. A hydraulic system is activated when the driver steps on the brake B. Force from the brake pedal operates on a hydraulic piston mounted under a fluid reservoir C. Hydraulic pressure is routed through hoses and tubing (brake lines) to a wheel cylinder or caliper to apply the brakes	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		A. Heat B. Friction C. Hydraulics (see theory)	Student will demonstrate a knowledge of hydraulic principles by passing a written test
X. Rebuild a wheel cylinder	A. The seals (cups) in wheel cylinders wear out, necessitating an overhaul B. Moisture in the brake fluid can cause rust to form on the wheel cylinder, creating a rough surface, causing the seals to wear rapidly	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Decimals B. Measurement	Friction (see theory)	Student will demonstrate an ability to rebuild a wheel cylinder by passing a performance test

UNIT: BRAKE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XI. Rebuild a disc brake caliper	Due to wear and the effects of corrosion, a disc brake caliper may have to be rebuilt	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		Chemical reactions Oxidation (rust) may occur inside the caliper bore due to moisture in the system	Student will demonstrate an ability to rebuild a disc brake caliper by achieving a moderate score on a performance test
XII. Rebuild a master cylinder	A. A master cylinder is rebuilt to replace leaking seals or gaskets B. If a more serious problem exists, the master cylinder should be replaced	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills		Friction	Student will demonstrate an ability to rebuild a master cylinder by passing a performance test with a moderate degree of skill

UNIT: BRAKE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XIII. Reface drum on brake lathe	Drums should be inspected for runout and excessive wear 1. Measure drum runout and diameter 2. If damage, excessive wear, or improper measurements are found, the drum must be refaced on a lathe	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Whole numbers B. Decimals C. Measurement		Student will be able to reface a brake drum on a brake lathe by passing a performance test with a moderate degree of skill
XIV. Reface a disc brake rotor	A. Rotors on a disc brake system can become warped or out of round due to a variety of reasons B. A complete disc brake job will include refacing of the rotors	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Oral communication I. Study skills J. Spelling skills	A. Whole numbers B. Common fractions C. Decimals D. Measurement		Student will demonstrate ability to reface rotors by passing a written test and a performance test

UNIT: BRAKE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XV. Use a micrometer to measure the inside diameter of brake drums	Drums may only be cut or "turned" within certain limitations beyond which they are unsafe to use	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Whole numbers B. Metrics C. Decimals D. Measurement	Heat 1. The brake drum must be able to dissipate the heat generated by the friction of brake action 2. Braking ability can fail and components may be damaged	Student will demonstrate an ability to use a drum brake micrometer on a brake drum by achieving a moderate level of skill on a performance test
XVI. Perform brake system inspection	All components of the braking system must be inspected periodically to assure that the system is in proper working order	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills			Student will be able to conduct a brake system inspection with a moderate degree of skill as determined by a performance test

UNIT: BRAKE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XVII. Use a micrometer to measure rotor thickness	A. Disc brake rotor should be refaced when brake pads are replaced B. The thickness of the rotor must be determined before it is refaced to make sure it is within allowable limits	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Oral communication I. Study skills	A. Whole numbers B. Decimals C. Measurement D. Metric conversion		Student will demonstrate an ability to measure rotor thickness with a micrometer and compare it to specifications by passing a written test and achieving a moderate skill level on a performance test
XVIII. Remove and replace disc brake pads on a vehicle	A. Due to wear, disc brake pads must be periodically replaced B. Methods differ with each vehicle so the student must consult manual for directions	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Test taking skills F. Oral communication G. Study skills			Student will demonstrate ability to remove and replace disc brake pads according to directions given in manual by achieving a moderate level of skill on a performance test

UNIT: BRAKE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XXI. Troubleshoot an automotive brake system to locate problem	A. Many different problems can occur in an automotive brake system B. Component failure or system failure can result C. A logical step by step troubleshooting procedure is used to determine the cause of the problem	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/ manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Problem solving K. Spelling L. Oral communication M. Study skills		A. Chemical reactions B. Friction C. Heat	Student will demonstrate a knowledge of correct troubleshooting procedure by passing a written test and by achieving a moderate level of skill on a performance test

UNIT: BRAKE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XIX. Manually bleed automotive hydraulic brake system	A. Air may sometimes alter the hydraulic system of an automobile's braking system causing problems such as 1. Spongy pedal 2. No pedal at all B. The braking system must then be "bled" to remove any air that may have entered the system C. The principle of hydraulics is that air is compressible and fluids are not	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills		Hydraulics Principle of hydraulics is that air is compressible and fluids are not	Student will demonstrate a knowledge of reasons and proper procedure for bleeding a brake hydraulic system manually by passing a written test and by achieving a moderate level of skill on a performance test
XX. Bleed a hydraulic brake system on an automobile using power bleeder	A. Air may sometimes enter the hydraulic system of an automobile's braking system causing problems such as 1. Spongy pedal 2. No pedal at all B. The braking system must then be "bled" to remove any air that may have entered the system C. The principle of hydraulics is that air is compressible and fluids are not	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills		Hydraulics Principle of hydraulics is that air is compressible and fluids are not	Student will demonstrate a knowledge of reasons and proper procedure for bleeding a brake hydraulic system using a power bleeder by achieving a moderate level of skill on a performance test

UNIT: SUSPENSION SYSTEMS

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Describe the different types of springs used in automobile suspension systems	A. The main parts of the suspension system are the springs B. Springs are used to support the automobile's frame, body, engine, and drivetrain C. The basic types of springs found on modern automobiles 1. Coil springs 2. Leaf springs 3. Torsion bars 4. Air springs	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		Torsion A torsion bar is a steel bar capable of twisting to provide spring action	Student will demonstrate an ability to identify the various types of spring suspension systems by achieving a moderate level of skill on a performance test
II. Explain the functions of the shock absorber	A. A shock absorber is a device that works with the springs to control movements of the body, wheel and axle B. A spring that is not controlled by a shock absorber will continue to expand and compress or "oscillate" several times C. Shock absorber dampens the number and extent of spring oscillations	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		Hydraulics 1. A piston inside the shock absorber moves up and down in a fluid filled chamber 2. The piston forces the fluid through small orifices, slowing the flow of the fluid and the piston, which slows the action of the springs 3. Shock absorbers may also be filled with air or gas which acts as a cushion, slowing spring action	Student will be able to demonstrate a knowledge of shock absorber operation by passing a written test

UNIT: SUSPENSION SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
III. Describe the operation of an independent suspension system	A. Modern automobiles have independent suspension systems at the front wheels B. An independent suspension system is designed to allow each wheel to move up and down separately, or independently C. Each wheel assembly has its own suspension system	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills			Student will demonstrate knowledge of independent suspension system by passing a written test
IV. Describe the operation of the MacPherson strut suspension	A. Many automobiles use MacPherson strut assemblies on both the front and rear of the automobile B. A MacPherson strut is a combination spring-shock absorber assembly	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		Hydraulics 1. A piston inside the shock absorber moves up and down in a fluid filled chamber 2. The piston forces the fluid through small orifices, slowing the flow of the fluid and the piston, which slows the action of the springs 3. Shock absorbers may also be filled with air or gas which acts as a cushion, slowing spring action	Student will demonstrate a knowledge of MacPherson strut operation by passing a written test

UNIT: SUSPENSION SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
V. Describe the components of rear wheel drive front end suspension system	Besides the springs, a typical front end suspension system includes the following components 1. Control arms 2. Wheel spindle assembly 3. Ball joints 4. Tie rods 5. Pitman arm 6. Idler arm 7. Stabilizer bar 8. Center link 9. Bushings	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills			Student will be able to identify front end suspension components by achieving a moderate level of skill on a performance test
VI. Describe a trailing arm suspension	A. Many front wheel drive automobiles have a trailing arm rear suspension B. A trailing arm extends rearward from the actual suspension mounting points on the body C. This allows for more interior room for the occupants	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Problem solving K. Spelling L. Oral communication M. Study skills			Student will demonstrate a knowledge of trailing arm rear suspensions by passing a written test

UNIT: SUSPENSION SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
VII. Repack wheel bearings on an automobile	A. Wheel bearings are normally inspected and relubricated, or repacked every 30,000 miles or whenever the brake system is removed B. If not properly maintained, friction and excessive heat will result, causing serious damage	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		A. Heat B. Friction If bearings are not properly maintained friction and excessive heat will result, causing serious damage	Student will demonstrate an ability to repack wheel bearings by achieving a moderate degree of skill on a performance test
VIII. Inspect the parts of the suspension system for wear and damage	A. A suspension inspection should be made during any routine maintenance and when a suspension problem is indicated B. A visual inspection is made to locate broken, bent, or worn suspension parts	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/manual F. Following directions G. Outlining and note taking H. Writing skills I. Problem solving J. Spelling K. Oral communication L. Study skills			Student will demonstrate an ability to perform a suspension system inspection by achieving a moderate level of skill on a performance test

UNIT: SUSPENSION SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
IX. Replace a shock absorber	A. Worn or damaged shock absorbers are a common suspension problem B. Servicing this part requires removing and replacing it C. Seals may leak and render the shock absorber useless	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		Hydraulics 1. A piston inside the shock absorber moves up and down in a fluid filled chamber 2. The piston forces the fluid through small orifices, slowing the flow of the fluid and the piston, which slows the action of the springs 3. Shock absorbers may also be filled with air or gas which acts as a cushion, slowing spring action	Student will demonstrate an ability to remove and replace a shock absorber by passing a performance test with a moderate degree of skill
X. Replace a ball joint on an automobile	A. It is not necessary to replace booth upper and lower ball joints at the same time B. Replace only the ball joint that is damaged or worn C. Procedures differ depending upon the vehicle D. Student must consult manual for proper procedures	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills			Student will demonstrate an ability to remove and replace a ball joint by achieving a moderate degree of skill on a performance test

UNIT: SUSPENSION SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XI. Replace control arm bushings	A. Bushing replacement is the most common service procedure performed on a control arm B. Service procedures differ so student must consult manual for specific instructions	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	Torque		Student will demonstrate a moderate level of skill on a performance test
XII. Replace a MacPherson strut assembly	A. Servicing MacPherson strut assemblies usually requires replacing the shock absorber unit only B. Proper service manual must be used when performing this procedure	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		Hydraulics 1. A piston inside the shock absorber moves up and down in a fluid filled chamber 2. The piston forces the fluid through small orifices, slowing the flow of the fluid and the piston, which slows the action of the springs 3. Shock absorbers may also be filled with air or gas which acts as a cushion, slowing spring action	Student will demonstrate ability to remove and replace a MacPherson strut assembly by achieving a moderate level of skill on a performance test

UNIT: WHEEL ALIGNMENT

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Describe how the parts of a steering linkage are connected	A. A steering wheel is the driver's direct contact with the steering system B. The steering wheel is connected to a steering shaft, which is rotated whenever the steering wheel is moved C. The shaft is connected to the steering gears which change rotating motion into side to side motion at the steering linkage	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	Geometry		Student will demonstrate an ability to describe the operation of the steering linkage by passing a written test and by achieving a moderate degree of skill on a performance test
II. Describe the action of a recirculating ball gearbox	A. A recirculating ball gearbox has two gears 1. Driving gear 2. Driven gear B. The driving gear, called the worm gear, is connected to the steering shaft, that is connected to the Pitman arm C. A sector gear has teeth that are arranged in a semi-circle D. The name "recirculating ball" is derived from what happens between the two gears	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Spelling J. Oral communication K. Study skills	A. Ratio and proportion B. Geometry		Student will be able to explain the operation of a recirculating ball steering gear by passing a written test

UNIT: WHEEL ALIGNMENT - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
III. Describe how a rack and pinion gearbox operates	A. A rack and pinion steering system is made up of a steering rack and a pinion gear B. The steering shaft is connected to the gear C. When the pinion gear is rotated, it is meshed with teeth cut into a metal bar, or rack D. The rack moves to the left or right, depending upon the rotation of the pinion gear	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Ratio and proportion B. Geometry		Student will be able to explain the operation of a rack and pinion steering system by passing a written test
IV. Describe the angles used in wheel alignment	A. Steering geometry, or front end geometry, is a term used to describe angles in the front suspension and steering in an automobile B. The five angles of front end geometry are 1. Camber 2. Caster 3. Steering axis inclination 4. Toe 5. Toe out on turns	A. Functional reading skills B. Vocabulary C. Following directions D. Outlining and note taking E. Test taking skills F. Writing skills G. Spelling H. Oral communication I. Study skills	A. Whole numbers B. Common fractions C. Decimals D. Measurement E. Proportion F. Geometry		Student will demonstrate an ability to describe the angles of front end geometry by passing a written test

UNIT: WHEEL ALIGNMENT - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
V. Check steering lubricant level	A. Only manual steering gearboxes are checked for lubricant level B. Power steering levels are checked at the hydraulic fluid reservoir C. Some gearboxes are permanently sealed, and adding lubricant to them is not recommended	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Problem solving K. Spelling L. Oral communication M. Study skills	Measurement	Friction Tires with incorrect air pressure or improper alignment will show different wear patterns and may cause handling problems due to varying degrees of traction (friction) with the road surface	Student will demonstrate ability to check steering gearbox lubricant level by passing a performance test with a moderate degree of skill
VI. Adjust a steering gearbox	A. Two adjustments can be made in a manual steering gearbox B. The adjustments are for worm bearing preload and lash, or gear mesh, between the ball nut and sector gear C. Preload adjustment is checked first D. Always check the proper service manual for steering gear adjustment, because the adjustment sequence is critical		Geometry		Student will demonstrate an ability to adjust a manual steering gearbox by achieving a moderate level of skill on a performance test

UNIT: WHEEL ALIGNMENT - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
VII. Replace a power steering pump	A. To remove a power steering pump, always disconnect the negative cable on the battery first B. Parts of the engine fan assembly and air conditioning system may have to be removed C. Remove the pump pulley, bracket, hoses and pump	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills			Student will demonstrate an ability to remove and replace a power steering pump by achieving a moderate level of skill on a performance test
VIII. Align shim type front end	A. Wheel alignment is not a periodic service B. Alignment problems show up most often in the form of vibration, difficult steering, or abnormal tire wear C. Wheel alignment should be made following suspension repair D. As a preventive measure, wheel alignment is checked and adjusted when new tires are installed on the front wheels	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Measurement B. Geometry		Student will be able to align a shim type front end by achieving a moderate level of skill on a performance test

UNIT: WHEEL ALIGNMENT - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
IX. Align cam type front end	A. Wheel alignment is not a periodic service B. Alignment problems show up most often in the form of vibration, difficult steering, or abnormal tire wear C. Wheel alignment should be made following suspension repair D. As a preventive measure, wheel alignment is checked and adjusted when new tires are installed on the front wheels	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Measurement B. Geometry		Student will be able to align a shim type front end by achieving a moderate level of skill on a performance test
X. Align MacPherson strut type front end	A. Wheel alignment is not a periodic service B. Alignment problems show up most often in the form of vibration, difficult steering, or abnormal tire wear C. Wheel alignment should be made following suspension repair D. As a preventive measure, wheel alignment is checked and adjusted when new tires are installed on the front wheels	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Measurement B. Geometry		Student will be able to align a shim type front end by achieving a moderate level of skill on a performance test

UNIT: WHEEL ALIGNMENT - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XI. Diagnose common steering problems	A. Tire wear is a good indication of problems in the steering system and/or with wheel alignment B. Tire wear patterns should always be checked first C. Steering problems may involved the suspension, wheels, and/or the tires D. All must be considered when diagnosing a steering problem E. To avoid acting on the wrong sympton, always road test the vehicle first	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Problem solving J. Spelling K. Oral communication L. Study skills	A. Ratio and proportion B. Geometry		Student will demonstrate an ability to diagnose steering problems by passing a written test

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Identify and describe the characteristics of gasoline and diesel motor fuels	A. Fuels used in automotive engines include petroleum fuels such as 1. Gasoline 2. Diesel fuel 3. Propane 4. Butane B. Alcohol type fuels can also be used	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Percentages B. Measurement	Chemical reactions 1. Due to the combustion process that takes place in the engine, various by products are formed 2. Among them are a. Water b. Carbon monoxide c. Sulfur compounds d. others	Student will be able to identify and describe the characteristics of automotive fuels by passing a written test
II. Visually identify and describe the parts of a basic fuel system on a vehicle	A basic fuel system consists of the following components 1. Fuel tank 2. Connecting lines 3. Fuel pump 4. Fuel filter 5. Air filter 6. Fuel metering and atomization system	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Decimals B. Percentages C. Measurement	A. Chemical reactions B. Fuels (See Fuel Systems I - Science Knowledge)	Student will be able to identify the parts of a basic fuel system by passing a written test and by achieving a moderate level of skill on a performance test

UNIT: FUEL SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
III. Explain the operation of a carburetor	A. A carburetor is a vacuum operated device that supplies a fine spray of gasoline into the incoming air stream B. The amount of gasoline is proportional to the amount of air drawn through the barrel of the carburetor C. The barrel is the throat opening or "throttle bore" D. The amount of air that passes through the carburetor can be controlled by operating a moveable valve called a "throttle plate" in an opening at the bottom of the carburetor bore	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		Vacuum A state of air pressure below that of atmospheric pressure	Student will demonstrate the ability to explain the operation of a carburetor by passing a written test
IV. Explain the function of a fuel pump in an automotive fuel system	A mechanical or electrical fuel pump is used to draw fuel from the fuel tank and deliver it to the carburetor or fuel injection system	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		Vacuum A state of air pressure below that of atmospheric pressure	Student will be able to describe the operation of a fuel pump by passing a written test

UNIT: FUEL SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
V. Explain the difference between difficult types of fuel injection systems	A. Electronic fuel injection systems perform exactly the same function as a carburetor B. It provides a range of air-fuel mixtures which allows the engine to run properly and efficiently at widely varying speeds, loads, and temperatures	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Whole numbers B. Decimals C. Ratio and proportion	A. Chemical reactions B. Heat	Student will demonstrate a basic understanding of fuel injection operation by passing a written test
VI. Practice fuel system safety	A. Working around fuel systems can be hazardous B. Perform fuel system service only in well ventilated areas C. Familiarize yourself with the location of shop fire extinguishers before beginning such work	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		A. Chemical reactions B. Heat C. Fuels	Student will demonstrate knowledge of safe working practices by passing a written test

UNIT: FUEL SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
VII. Identify and describe the source of fuel leaks	A. Leaks can occur at any point in the fuel system B. This includes everything from the filler cap forward to the intake manifold C. Check for leaks at the following points 1. Filler cap 2. Filler neck 3. Fuel tank seams 4. Fuel and vapor line connections 5. Fuel lines 6. Fuel filter 7. Fuel pump 8. Vapor canister 9. Carburetor 10. Fuel injection pump 11. Carburetor gaskets 12. Intake manifold gaskets	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills			Student will demonstrate an ability to locate fuel leaks by passing a performance test
VIII. Perform basic tests on a gasoline fuel pump	Three tests may be made to determine if a fuel pump is defective and needs to be replaced 1. Pressure test 2. Volume test 3. Inlet vacuum test	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Whole numbers B. Fractions C. Weights and measurement		Student will demonstrate a knowledge of fuel pump test procedures by passing a written test and by achieving a moderate level of skill on a performance test

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
IX. Replace a gasoline fuel pump	A. Modern fuel pumps are not repairable B. They must be replaced if faulty	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Test taking skills F. Problem solving G. Spelling H. Oral communication I. Study skills	Torque	Fuels	Student will demonstrate an ability to remove and replace a fuel pump by achieving a moderate level of skill on a performance test
X. Explain the basic processes that are involved in carburetion	A. Carburetion means enriching a gas, (usually air) by combining it with a carbon containing compound (a hydrocarbon fuel, usually gasoline) B. There are three general stages involved in carburetion 1. Metering 2. Atomization 3. Vaporization C. Vacuum produced by an engine draws fuel through the throat (venturi) of carburetor, atomizing it D. As it passes through the intake manifold, engine heat vaporizes it	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Spelling J. Oral communication K. Study skills	Ratio and proportion	See theory	Student will demonstrate a knowledge of basic carburetor operation by passing a written test

UNIT: FUEL SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XI. Identify and describe the six basic carburetor circuits	There are six basic carburetor circuits, each with a different function 1. Float 2. Idle 3. Accelerator pump 4. Main metering 5. Enrichment 6. Choke	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Decimals B. Measurement C. Ratio and proportion		Student will demonstrate a knowledge of the six basic carburetor circuits by passing a written test
XII. Perform routine carburetor maintenance	Routine carburetor maintenance consists of the following procedures 1. Replacing air and pcv valves 2. Replacing fuel filter 3. Checking for air and fuel leaks 4. Cleaning linkages 5. Check and/or adjust automatic choke	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Oral communication			Student will demonstrate ability to perform routine carburetor maintenance by achieving a moderate level of skill on a performance test

UNIT: FUEL SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XIII. Adjust idle speed and fast idle speed	Proper idle speed and fast idle speed must be adjusted according to manufacturers' specifications to insure efficient operation	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Oral communication	A. Whole numbers B. Measurement C. Ratio and proportion	Fuels 1. The ideal air to fuel ratio is 14.7 parts air to 1 part fuel 2. This is known as stoichiometric proportion	Student will demonstrate ability to make idle adjustments on a carburetor by achieving a moderate level of skill on a performance test
XIV. Check and/or replace loose or damaged intake manifold and carburetor vacuum lines	A. Loose or damaged vacuum lines can cause poor engine performance B. Excess air will enter the system, leaning out the air/fuel ratio	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Problem solving F. Oral communication	Ratio and proportion	Fuels 1. The ideal air to fuel ratio is 14.7 parts air to 1 part fuel 2. This is known as stoichiometric proportion	Student will demonstrate an ability to check and replace vacuum lines by achieving a moderate level of skill on a performance test

UNIT: FUEL SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XV. Rebuild and adjust a carburetor	Carburetor overhaul consists of these basic steps 1. Carburetor identification 2. Disconnecting attachments to the carburetor 3. Carburetor removal 4. Carburetor disassembly 5. Cleaning and inspection 6. Replacement of parts and gaskets 7. Bench adjustments 8. Re-assembly 9. Replacement on vehicle 10. Re-attaching parts 11. Final adjustments	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Problem solving F. Oral communication G. Study skills	A. Whole numbers B. Common fractions C. Decimals D. Measurement		Student will demonstrate an ability to rebuild a carburetor by achieving a moderate level of skill on a performance test

UNIT: FUEL SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XVI. Diagnose driveability problems in a carburetor equipped fuel system	A. Driveability describes the proper operation of a vehicle B. Driveability problems include 1. Dieseling 2. Detonation 3. Stalling 4. Rough idle 5. Hesitation 6. Surging 7. Sluggishness 8. Poor gas mileage	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/ manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Problem solving J. Spelling K. Oral communication L. Study skills	Ratio and proportion	Fuels 1. The ideal air to fuel ratio is 14.7 parts air to 1 part fuel 2. This is know as stiochiometric proportion	Student will demonstrate a knowledge of common fuel system problems by passing a written test and by achieving a moderate degree of accuracy in actual diagnosis of fuel system problems
XVII. Explain the advantages of fuel injection over carburetion	A. In a gasoline engine, fuel injection performs the same functions as a carburetor B. However, fuel injection systems offer several advantages over carburetion 1. Increased volumetric efficiency 2. More efficient combustion 3. Better fuel economy 4. More power 5. Less harmful exhaust gases C. Fuel distribution to each of the cylinders in precise amounts to insure the proper mixture at the precise time	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/ manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Problem solving J. Spelling K. Oral communication L. Study skills	A. Measurement B. Ratio and proportion	Fuels 1. Fuel injection 2. The ideal air to fuel ratio is 14.7 parts air to 1 part fuel 3. This is known as stoichiometric proportion	Student will demonstrate a knowledge of the advantages of fuel injection over carburetion by passing a written test

UNIT: FUEL SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XVIII. Describe the function of an electronic fuel injection system	A. A fuel injection system must provide the correct air-fuel ratio for all engine load, speed, and temperature conditions B. The basic system includes 1. Fuel tank and connecting lines 2. Fuel pump(s) 3. Fuel pressure regulator 4. Fuel filters 5. Electronic control unit 6. Input information sensors 7. Fuel injectors	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	Ratio and proportion	Fuels 1. Fuel injection 2. The ideal air to fuel ratio is 14.7 parts air to 1 part fuel 3. This is known as stoichiometric proportion	Student will demonstrate an ability to describe the basic operation of an electronic fuel injection system by passing a written test
XIX. Perform fuel injection system preventive maintenance	Preventive maintenance for fuel injection systems includes checking and repairing or replacin the following 1. Fuel and air leaks 2. Loose or damaged vacuum lines 3. Loose or corroded electrical connection 4. Loose or improperly supported fuel rails, lines and injectors 5. Dirty fuel and air filters 6. Incorrect idle speed or mixture	A. Functional reading skills B. Vocabulary C. Signal words D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Problem solving J. Spelling K. Oral communication L. Study skills	Ratio and proportion	Fuels	Student will demonstrate a knowledge of preventive maintenance procedures for fuel injection systems by passing a written test and by achieving a moderate level of skill on a performance test

UNIT: EMISSION CONTROLS

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Identify and describe sources and effects of air pollution	A. Pollution means a process of contamination B. Air pollution is the contamination of air by harmful substances C. Man-made air pollution is caused mainly by the burning of fuel to produce heat and power	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Signal words E. Parts of textbook/manual F. Following directions G. Outlining and note taking H. Test taking skills I. Writing skills J. Problem solving K. Spelling L. Oral communication M. Study skills	A. Percentages B. Graphs	A. Heat B. Fuels	Student will demonstrate a knowledge of common causes of air pollution as related to the automobile by passing a written test
II. Identify and describe the products of complete combustion and incomplete combustion of a hydrocarbon fuel	A. If combustion is 100% efficient, the by-products are water vapor and carbon dioxide B. Both of these are harmless chemicals C. 100% combustion is never achieved in an internal combustion engine D. Exhaust gases always contain some unburned hydrocarbon (HC) fuel and incomplete combustion produces carbon monoxide (CO), a toxic gas	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Percentages B. Ratio and proportion	A. Chemical reactions B. Heat C. Fuels	Student will demonstrate an ability to describe the effects of complete and incomplete combustion by passing a written test

UNIT: EMISSION CONTROLS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
III. Locate emission control labels on late model vehicles	A. Emission control labels are usually located in the engine compartment of late model vehicles B. They give specific information relating to tune-up and other adjustments C. The information on the emission control decal or label always supercedes any instructions given in a manual	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Spelling J. Oral communication		Fuels	Student will demonstrate an ability to locate the emissions control label on a vehicle by passing a performance test
IV. Identify and describe common emission control systems found on modern automobiles	Common emission control equipment found on modern automobiles include the following 1. Evaporative emission controls 2. Positive crankcase ventilation (PCV) 3. Fuel system modification and controls 4. Exhaust gas recirculation 5. Air injection 6. Catalytic converters	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		A. Chemical reactions B. Heat C. Fuels All of the emission control devices on modern automobiles are designed to control the heat of combustion which affects some of the chemical compounds released into the air Others are to control the emission of hydrocarbon gases	Student will demonstrate an ability to identify common emission control systems and explain their operation by passing a written test and by achieving a moderate level of skill on a performance test

UNIT: EMISSION CONTROLS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
V. Explain what problems are caused by tampering with emission control devices	A. Federal and state laws prohibit intentional tampering with equipment that can change vehicle emissions B. Tampering means removing, modifying, disconnecting, or disabling such devices	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/manual E. Following directions F. Outlining and note taking H. Test taking skills J. Writing skills K. Spelling L. Oral communication M. Study skills		Fuels	Student will demonstrate a knowledge of problems involved with tampering with emission control devices by passing a written test
VI. Perform an infra-red emissions analyzer test on a vehicle	A. To perform an emissions analyzer test on a vehicle, a sampling probe is inserted into the tailpipe of the vehicle to be tested B. If a vehicle has higher levels of pollution than is permitted by N.J. State law, the readings obtained will indicate as such C. Testing is done to show the levels of carbon monoxide and hydrocarbons	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Problem solving J. Spelling K. Oral communication L. Study skills	A. Percentages B. Measurement C. Ratio and proportion	Chemical reactions 1. Carbon monoxide is produced by an improper air/fuel mixture 2. Hyrdocarbons is the presence of unburned fuel in the exhaust gases	Student will demonstrate an ability to perform an exhaust gas analysis with an infra-red emissions analyzer by achieving a moderate skill level on a performance test

UNIT: EMISSION CONTROLS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
VII. Troubleshoot a vehicle with excessive exhaust emissions to determine the cause of the problem	Excessive exhaust emissions can be caused by a variety of reasons - among them are 1. Vacuum leaks 2. Carburetor adjustment 3. Ignition timing adjustment 4. Defective or inoperable emission control equipment 5. Ignition miss 6. Carbon buildup	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Problem solving I. Oral communication	Ratio and proportion	Chemical reactions 1. Carbon monoxide is produced by an improper air/fuel mixture 2. Hydrocarbons is the presence of unburned fuel in the exhaust gases	Student will demonstrate a knowledge of troubleshooting procedure by passing a written test and by achieving a moderate level of skill on a performance test

UNIT: DRIVE TRAINS

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Explain how the driveline operates	A. The parts of a rear wheel drivetrain are 1. Clutch or torque converter 2. Manual or automatic transmission 3. Driveline 4. Differential 5. Driving axles B. The purpose of the driveline is to transfer torque, or turning force, from the transmission to the differential C. The driveline, or driveshaft, consists of a hollow tube or solid shaft with one or more flexible joints	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skils G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Ratio and proportion B. Geometry C. Torque		Student will demonstrate a knowledge of drive train components and their function by passing a written test
II. Explain the purpose of universal joints	A. A U-joint can transfer torque at an angle while rotating B. A front U-joint accepts torque from the transmission and transmits the torque to the driveshaft C. The rear U-joint accepts torque from the driveshaft and transmits the torque to the differential D. Thus, the driveshaft can move as required by road and driving conditions without interrupting torque transfer	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Outlining and note taking E. Test taking skills F. Writing skills G. Spelling H. Oral communication I. Study skills	A. Ratio and proportion B. Geometry	See theory	Student will be able to demonstrate a knowledge of U-joint operation by passing a written test

UNIT: DRIVE TRAINS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
III. Explain how a constant velocity U-joint works	A. As U-joint angles increase, driveshaft speed fluctuation and vibration increase B. Also, conventional U-joints are limited as to the angle at which they can operate C. When driveshaft angles become too great for conventional U-joints, a constant velocity U-joint is used, which maintains a relatively constant speed during rotation	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Ratio and proportion B. Geometry C. Torque	See Theory	Student will be able to demonstrate an ability to explain the operation of a constant velocity U-joint on a written test and identify one on a vehicle as demonstrated by a performance test
IV. Clean, inspect, and lubricate a driveline	A. Remove any dirt, mud, undercoating, or other foreign material from the driveline B. Use a droplight to inspect the driveline C. Grasp the driveshaft near the front U-joint and try to move the U-joint back and forth to check for looseness or play D. No motion should be felt at all E. Do the same at the rear U-joint F. Factory installed U-joints usually cannot be lubricated, but if grease fittings can be located, lubrication can be made	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Oral communication	A. Geometry B. Torque		Student will demonstrate an ability to clean, inspect, and lubricate a driveshaft and U-joint assembly by achieving a moderate level of skill on a performance test

UNIT: DRIVE TRAINS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
V. Describe the operation of a manual transmission	A. A manual transmission consists of parallel sets of metal shafts on which meshing gear sets of different ratios are mounted B. Engine torque is connected to, or disconnected from, the transmission by engaging, or disengaging, the clutch	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Whole numbers B. Common fractions C. Ratio and proportion		Student will be able to demonstrate a knowledge of manual transmission operation by passing a written test
VI. Explain how engine power is transferred by the clutch disc to the transmission	A. The clutch is located between the engine and the transmission B. The clutch allows the driver to connect or disconnect power from the engine to the transmission C. The clutch also allows the driver to shift smoothly and to start the engine D. A clutch assembly contains several parts 1. Flywheel 2. Clutch disc 3. Pressure plate assembly 4. Throw-out bearing 5. Clutch fork	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	Torque	Friction Dry friction occurs when objects directly contact each other, with no lubrication	Student will be able to describe the parts of a clutch assembly as demonstrated by passing a written test

UNIT: DRIVE TRAINS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
VI. Perform clutch preventive maintenance	Clutch preventive maintenance includes 1. Lubrication 2. Linkage adjustment	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Oral communication	Measurement	A. Friction - dry B. Friction Mechanical linkages must be periodically lubricated to prevent rapid wear	Student will demonstrate an ability to perform clutch preventive maintenance by achieving a moderate level of skill on a performance test
VII. Disassemble and reassemble a clutch assembly	A. Removing and replacing the clutch in an automobile also requires the removal of the driveline and the transmission B. Specific manual instructions must be followed	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions	Measurement		Student will demonstrate an ability to disassemble and reassemble a clutch assembly by achieving a moderate level of skill on a performance test

UNIT: DRIVE TRAINS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
IX. Describe the basic operation of an automatic transmission	A. An automatic transmission receives signals from the engine output shaft and from the driver to shift into forward gears "automatically" B. An automatic transmission engages and disengages engine power without a manually operated clutch	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	Ratio and proportion	Hydraulics An automatic transmission utilizes fluid pumped to control valves that determine the transmissions mode of operation	Student will demonstrate knowledge of basic automatic transmission operation by passing a written test
X. Check for proper fluid level and diagnose the condition of the transmission fluid	A. Fluid level is checked with a dipstick, usually when the engine is running and the fluid is at operating temperature B. The condition of ATF should always be noted when the fluid level is checked C. The condition of the fluid can indicate a transmission problem	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Problem solving F. Oral communication	Measurement	A. Heat If transmission fluid is overheated and burned, it must be replaced B. Hydraulics The proper level of fluid must be maintained for proper operation	Student will demonstrate an ability to properly check transmission fluid level and to diagnose condition of the transmission fluid by achieving a moderate level of skill on a performance test

UNIT: DRIVE TRAINS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XI. Perform a fluid and filter change on an automatic transmission	A. Fluid can be drained by removing a drain plug or by loosening oil pan bolts B. A disposable filter or screen is used to remove particles from the ATF C. This is a routine service procedure	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Oral communication	A. Whole numbers B. Weights and measurement	Heat If transmission fluid is overheated or burned, it must be replaced	Student will demonstrate an ability to perform an automatic transmission fluid and filter change by achieving a moderate level of skill on a performance test
XII. Describe the operation of the differential and the function it performs in an automobile	A. The differential is an assembly of gears located between the two driving axles B. The differential has two jobs 1. It changes the angle of power flow 2. It provides varying amounts of torque to the driving axles C. Torque enters the differential at the pinion gear which meshes with a larger ring gear D. The ring gear transfers torque to the driving axles	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Whole numbers B. Common fractions C. Decimals D. Measurement E. Ratio and proportion F. Geometry G. Torque		Student will be able to explain the operation of a differential and its function in an automobile by passing a written test

UNIT: DRIVE TRAINS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XIII. Drain and refill differential with proper amount and type of gear lube	Differential must periodically be drained and refilled with proper type and amount of lubricant to maintain proper operation	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions	A. Whole numbers B. Common fractions C. Measurement	Friction Proper lubrication is essential in excess wear and damage	Student will demonstrate an ability to drain and refill differential with proper type and amount of lubricant by achieving a moderate level of skill on a performance test
XVI. Perform routine differential service	A. Routine differential service consists of checks made to determine whether the differential is operating within specifications B. Checks include 1. Differential bearing preload 2. Backlash 3. Gear tooth contact pattern test	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Decimals B. Measurement C. Ratio and proportion		Student will demonstrate an ability to perform differential service procedures by passing a written test and by achieving a moderate level of skill on a performance test

UNIT: ENGINE SYSTEMS

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Define and explain the terms A. Energy B. Force C. Work D. Power	A. To understand how an automobile engine works, the student must understand some basic terms that describe physical processes B. Energy, force, work, and power are concepts which must be understood before beginning to understand the operation of an internal combustion engine	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Measurement B. Physics C. Torque	A. Heat B. Fuels C. Friction Heat energy is produced by the rapid burning of fuel which exerts force on the piston, thus producing mechanical energy Work is the applying of force to an object, causing it to move Power is the rate, or how fast the work is done The engine produces torque, or twisting force to turn the drive wheels	Student will demonstrate an ability to describe the basic physics involved in internal combustion engine operation by passing a written test
II. Identify and describe the functions of the internal parts of an automotive engine	A. An automotive internal combustion engine is made up of many parts B. The major parts of an engine include 1. Cylinder block 2. Pistons and rings 3. Crankshaft 4. Connecting rods 5. Bearings 6. Cylinder head 7. Valves 8. Camshaft and valve 9. Train 10. Flywheel 11. Fuel system 12. Exhaust system	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Measurement B. Torque	A. Heat B. Metallurgy Many different types of metals are used in an engine These may include cast iron, aluminum, steel of various degrees of hardness, and other alloys, all of which react to the heat of combustion in different manners	Student will be able to demonstrate an ability to identify and describe the parts of an internal combustion engine by passing a written test

UNIT: ENGINE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
III. Describe the four stroke cycle	A. The basic engine must draw in an air/fuel mixture, compress it, burn it, and get rid of the gases B. This sequence of events makes up what is known as the four stroke cycle	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Physics B. Torque	A. Chemical reactions B. Heat C. Fuels	Student will demonstrate a knowledge of the four stroke cycle by passing a written test
IV. Determine the compression ratio of an engine	A. The compression ratio is a comparison between the volume above the piston at BDC and the volume above the piston at TDC (clearance volume) B. The volume of the combustion chamber in the cylinder head must be considered when determining compression ratio	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/ manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Problem solving J. Spelling K. Oral communication L. Study skills	A. Whole numbers B. Common fractions C. Decimals D. Measurement E. Ratio and proportion F. Formulas G. Metric conversion	See theory	Student will demonstrate an ability to determine compression ratio by passing a written test

UNIT: ENGINE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
V. Determine the cubic inch displacement of an automotive engine	A simplified formula for engine displacement is 0.785 x bore diameter 2 x length of stroke x number of cylinders	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Problem solving J. Spelling K. Oral communication L. Study skills	A. Whole numbers B. Fractions C. Decimals D. Measurement E. Ratio and proportion F. Formulas G. Metric conversion		Student will demonstrate an ability to determine cubic inch displacement of an engine by passing a written test
VI. Explain the formula for determining engine horsepower and torque Explain the relationship of horsepower to torque	A. The formula for determining work is Work = force x distance B. If torque output of an engine at a given RPM is known, horsepower can be determined by this formula Horsepower = torque x RPM divided by 5,252	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Whole numbers B. Common fractions C. Decimals D. Measurement E. Formulas F. Torque G. Graphs		Student will demonstrate an ability to use formulas to determine horsepower and torque by passing a written test

UNIT: ENGINE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
VII. Describe how friction may affect engine performance	Different types of friction may be present between parts in an engine 1. Dry friction 2. Greasy friction 3. Viscous friction	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	Whole numbers	Friction 1. Dry friction occurs when objects move in direct contact with each other, causing heat and wear 2. Greasy friction exists when a thin film of oil or grease is present between the surfaces 3. Viscous friction is the resistance to motion of liquids - the viscosity rating of motor oil is a measurement of its resistance to flow	Student will demonstrate an ability to describe the effects of different types of friction by passing a written test

UNIT: ENGINE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
VIII. Describe crankshaft design and construction	A. The crankshaft must change the downward power pulses from the connecting rods into a rotating motion B. The areas where bearings support and protect the spinning crankshaft are called journals C. Rod journals are located on the throws, or the offset areas of the crankshaft where the connecting rods are located, and main journals are the areas where the crankshaft is attached to the block D. Crankshafts can be cast, forged, or machined from a solid bar, or billet E. During manufacture, counterweights are formed to balance the offset throws	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	Measurement	A. Heat See Engine Systems I - Science Knowledge B. Metallurgy See Engine Systems II - Science Knowledge C. Friction See Engine Systems VII - Science Knowledge	Student will demonstrate an ability to describe the design and construction of a crankshaft by passing a written test

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
IX. Describe the function of bearings within an engine	A. One of the most important factors in engine life is the durability of engine bearings B. If bearings fail, the entire engine will be ruined C. Friction is the resistance between two materials in contact with each other D. To reduce friction, two types of bearings can be used 1. Anti-friction ball and roller bearings 2. Friction, or insert bearings E. Crankshaft bearings are friction bearings also known as precision insert bearings	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication	A. Decimals B. Measurement	A. Heat See Engine Systems - I - Science Knowledge B. Metallurgy See Engine Systems - II - Science Knowledge C. Friction See Engine Systems VII - Science Knowledge	Student will demonstrate an ability to describe the function of engine crankshaft bearings by passing a written test

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
X. Describe the function performed by gaskets within an engine	A. A gasket forms a seal by being compressed between two parts B. Gaskets can be made of soft materials such as cork, rubber, paper, asbestos or a combination of these materials C. Gaskets can also be formed of soft metals such as copper, brass, aluminum, etc.	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills			Student will demonstrate an ability to describe the function of gaskets within an engine by passing a written test
XI. Identify the major parts of a piston, and describe its function within the engine	A. The piston must be able to withstand the heat of combustion and transfer force to the connecting rod B. To meet these requirements, the piston must be both light and strong C. A piston is comprised of the following major parts 1. Land 2. Ring belt 3. Crown 4. Piston pin 5. Skirt 6. Piston pin bushing 7. Oil ring groove 8. Compression ring grooves	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Decimals B. Measurement	A. Heat See Engine Systems - I - Science Knowledge B. Metallurgy See Engine Systems - II - Science Knowledge C. Friction See Engine Systems - VII - Science Knowledge	Student will demonstrate a knowledge of piston parts and function by passing a written test and achieving a moderate level of skill on a performance test

UNIT: ENGINE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XII. Describe the function of piston rings in an engine	A. There are two types of rings found on a piston 1. Compression rings 2. Oil control rings B. Compression rings hold the pressure generated during combustion C. Oil rings scrape excess oil off the lower cylinder walls	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		Friction See Engine Systems VII - Science Knowledge	Student will demonstrate an ability to describe the function of piston rings by passing a written test
XIII. Use the proper measuring device to measure cylinder bore diameter and taper	Different measuring devices can be used to measure cylinder bore diameter and taper 1. Inside micrometer 2. Telescoping gauges 3. Cylinder bore taper dial indicator	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/ manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Problem solving J. Spelling K. Oral communication J. Study skills	A. Whole numbers B. Decimals C. Measurement	Friction 1. All moving parts in an engine eventually wear, no matter how well lubricated 2. Clearances between moving parts in an engine are critical and wear must be accurately determined to effectively service or repair an engine	Student will demonstrate an ability to measure cylinder bore diameter and taper by achieving a moderate level of skill on a performance test

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XIV. Measure crankshaft journals with a micrometer	Crankshaft journals must be measured to determine if wear has exceeded limitations	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Problem solving J. Spelling K. Oral communication L. Study skills	A. Whole numbers B. Decimals C. Measurement	Friction 1. All moving parts in an engine eventually wear, no matter how well lubricated 2. Clearances between moving parts in an engine are critical and wear must be accurately determined to effectively service or repair an engine	Student will demonstrate an ability to measure crankshaft journals with a micrometer by achieving a moderate level of skill on a performance test
XV. Replace crankshaft rod and main bearings	A. Crankshaft rod and main bearings periodically wear out requiring their replacement B. Measurement must be accurately determined within .001 of an inch	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Decimals B. Measurement	Friction 1. All moving parts in an engine eventually wear, no matter how well lubricated 2. Clearances between moving parts in an engine are critical and wear must be accurately determined to effectively service or repair an engine	Student will demonstrate an ability to replace rod and main bearings by achieving a moderate level of skill on a performance test

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XVI. Replace piston rings in an engine	Due to wear, piston rings must occasionally be replaced to correct loss of compression and to correct oil consumption problems	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Problem solving I. Spelling J. Oral communication K. Study skills	A. Decimals B. Measurement	Friction 1. All moving parts in an engine eventually wear, no matter how well lubricated 2. Clearances between moving parts in an engine are critical and wear must be accurately determined to effectively service or repair an engine	Student will demonstrate an ability to replace piston rings in an engine by achieving a moderate level of skill on a performance test
XVII. Explain and describe basic cylinder head design configuration	A. The cylinder head forms the combustion chamber B. Combustion chamber design can vary with the design of the engine C. Two types of cylinder heads commonly used in passenger vehicle engines are 1. Wedge combustion chamber 2. Hemispherical combustion chamber	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Spelling J. Oral communication K. Study skills	A. Measurement B. Formulas C. Geometry D. Metric conversion	Fuels 1. When gasoline is ignited, it does not explode, it burns rapidly in ever expanding circles 2. Combustion chamber design determines energy distribution on the top of the piston	Student will demonstrate an ability to describe various cylinder head designs by passing a written test

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XVIII. Describe the difference between overhead camshaft and pushrod valve train designs	A. Overhead camshaft (OHC) can use a single overhead camshaft (SOHC) with intake and exhaust valve cams on the same shaft B. Valve trains use a combination of camshaft, lifters, and pushrods to control the opening and closing of the valve	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Measurement B. Ratio and proportion C. Geometry		Student will demonstrate an ability to describe the difference between overhead camshaft and pushrod valve train designs by passing a written test
XIX. Describe valve design and function	A. The valves in an automobile engine must be able to function reliably under harsh condition for many miles B. During this time, the valves may be cycled several hundred million times	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Outlining and note taking E. Test taking skills F. Writing skills G. Spelling H. Oral communication I. Study skills	A. Measurement B. Geometry		Student will demonstrate a knowledge of valve design and function by passing a written test

UNIT: ENGINE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XX. Describe the components of the valve spring assembly	A valve spring assembly can include the following parts 1. Valve spring seat 2. Valve stem seal 3. Valve spring 4. Spring damper 5. Valve spring retainer 6. Valve locks 7. Valve rotator	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Decimals B. Measurement C. Geometry	Heat	Student will demonstrate a knowledge of basic valve spring assembly by passing a written test
XXI. Describe the operation of hydraulic valve lifters and solid valve lifters	A. The valve train must be able to pull the valves fully closed B. To accomplish this action, either solid or hydraulic valve lifters may be used C. Hydraulic lifters have largely replaced the older solid lifters on modern engines D. Solid lifters continue to be used in most overhead cam designs	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Decimals B. Measurement	Hydraulics 1. Hydraulics is the creation of force or motion by a fluid under pressure 2. A hydraulic lifter uses oil under pressure to transfer force to the valve train	Student will demonstrate an ability to describe solid and hydraulic lifter operation by passing a written test

UNIT: ENGINE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XXII. Remove and replace a cylinder on an engine	A. Cylinder head removal is necessary for many operations involving the automobile engine valve train B. A manual must be consulted for specific procedures to be followed for each particular automobile C. When replacing the cylinder head, specific tightening sequences and specifications must be followed	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Whole numbers B. Measurement C. Common fractions D. Torque		Student will demonstrate an ability to remove and replace a cylinder head by achieving a moderate level of skill on a performance test
XXIII. Disassemble cylinder head and reface valve seats and valve faces using the valve refacing machine and the seat grinder	Valve seats and valve faces may occasionally need to be resurfaced or machined due to wear or burning or replaced due to breakage or malfunction	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Whole numbers B. Geometry C. Measurement D. Decimals	A. Heat B. Friction 1. All moving parts in an engine eventually wear, no matter how well lubricated 2. Clearances between moving parts in an engine are critical and wear must be accurately determined to effectively service or repair an engine	Student will demonstrate an ability to reface cylinder head valves and seats by achieving a moderate level of skill on a performance test

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XXIV. Perform a valve adjustment on an automobile engine	A. Valve clearance adjustments are required at specified intervals on engines with solid or mechanical lifters B. Engines with hydraulic lifters normally require adjustment only when an engine is being reassembled	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Common fractions B. Decimals C. Measurement D. Whole numbers	Heat 1. Valve stem length is affected by the engine heat 2. If the proper clearances are not maintained, performance will suffer and valve damage may result	Student will demonstrate an ability to adjust valve lifters by achieving a moderate level of skill on a performance test
XXV. Inspect the valve train of an automobile engine	Inspection of the valve train includes checking for the following problems 1. Loose mounting bolts, nuts, or studs 2. Worn or pitted camshaft lobes 3. Broken valve springs 4. Bent pushrods 5. Improperly seated valve locks and retainers. 6. Missing or damaged valve train seals	A. Vocabulary B. Parts of textbook/ manual C. Following directions D. Outlining and note taking E. Test taking skills F. Spelling G. Oral communication	A. Decimals B. Measurement	A. Heat B. Friction 1. All moving parts in an engine eventually wear, no matter how well lubricated 2. Clearances between moving parts in an engine are critical and wear must be accurately determined to effectively service or repair an engine	Student will demonstrate an ability to perform a valve train inspection by achieving a moderate level of skill on a performance test

UNIT: ENGINE SYSTEMS - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XXVI. Check for proper valve guide clearance and camshaft lobe lift	Pushrod engine camshaft lobes can be checked for wear and correct lift by using a dial indicator mounted on the cylinder head	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Decimals B. Measurement	Friction 1. All moving parts of an engine eventually wear, no matter how well lubricated 2. Clearances between moving parts in an engine are critical and wear must be accurately determined to effectively service or repair an engine	Student will demonstrate an ability to measure valve guide clearance and camshaft lobe lift by achieving a moderate level of skill on a performance test

UNIT: TUNE-UP

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Identify and describe the ignition system parts on a vehicle	A. An ignition system includes a low voltage primary circuit and a high voltage secondary circuit B. The basic operation of all spark ignition systems is the same C. A basic system consists of 1. Battery 2. Ignition coil 3. Switch 4. Primary and secondary wiring connections 5. Spark plug(s)	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Decimals B. Measurement	Magnetism and electricity 1. Any conductor with current flowing through it is surrounded by a magnetic field 2. An ignition coil is a step-up transformer capable of taking low battery voltage (12V) and creating a momentary high voltage spark of up to 40,000 V. 3. This high voltage is necessary to cause a spark to jump and air gap at the end of the spark plug, thus igniting the fuel/air mixture in the combustion chamber	Student will demonstrate an ability to describe the parts of an ignition system and their function by passing a written test

UNIT: TUNE-UP - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
II. Explain how an ignition system operates and identify what factors influence correct ignition timing	A. The ignition system produces a spark at the proper point in a gasoline engine four stroke cycle B. The spark must be sufficiently strong to jump the spark plug air gap and ignite the air-fuel mixture, beginning combustion	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		A. Electricity See Tune-Up I - Science Knowledge B. Fuels 1. When gasoline is ignited, it does not explode, it burns rapidly in ever expanding circles 2. Combustion chamber design determines energy distribution on the top of the piston	Student will be able to demonstrate an ability to explain the operation of the ignition system and the factors that affect ignition timing by passing a written test
III. Describe the parts of the distributor and their function	A. A distributor controls primary current and distributes secondary current B. A distributor includes the following parts 1. Housing 2. Shaft and drive mechanism 3. Switching device 4. Rotor 5. Cap	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	Whole numbers	Electricity See Tune-Up I - Science Knowledge	Student will demonstrate knowledge of distributor construction and operation by passing a written test

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
IV. Determine what type of switching device is used in the ignition system of an automobile	A. A set of breaker points is a mechanically operated switch B. On modern vehicles, an electronic switching device is used, which eliminates breaker point problems that are due to wear C. Service procedures vary so correct identification is essential	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Decimals B. Measurement	Magnetism and electricity See Tune-Up I - Science Knowledge	Student will demonstrate an ability to determine the type of switching mechanism used on an automotive ignition system by passing a written test and achieving a moderate level of skill on a performance test
V. Describe the function and operation of the primary and secondary ignition circuits	A. A basic primary circuit consists of a current source, a primary ignition coil, and a switching device that controls current flow B. The secondary circuit consists of the secondary coil winding coil cable, rotor, spark plug cables, and spark plugs	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Writing skills G. Spelling H. Oral communication I. Study skills		Magnetism and electricity See Tune-Up I - Science Knowledge	Student will demonstrate a knowledge of the primary and secondary ignition system circuits by passing a written test

UNIT: TUNE-UP - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
VI. Describe the construction and function of spark plug cables	A. Spark plug cables are made up of strands of carbon impregnated fiberglass B. These strands are surrounded by layers of insulation and an outer jacket C. Their purpose is to conduct the high voltage current produced by the coil to the spark plug to begin combustion of the air-fuel mixture	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	Measurement	Electricity See Tune-Up I - Science Knowledge	Student will demonstrate a knowledge of spark plug cable design and function by passing a written test
VII. Describe the construction and operation of spark plugs	A. Spark plugs are made up of several separate parts B. High voltage current from the secondary coil completes a circuit across the air-gap between the center and ground electrodes	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	Weights and measurement	Electricity See Tune-Up I - Science Knowledge	Student will demonstrate a knowledge of spark plug design and operation by passing a written test

UNIT: TUNE-UP - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
VIII. Describe spark plug heat range	A. Spark plugs are available in different heat ranges B. Heat range determines how well a spark plug can conduct heat away from the tip C. A "colder" plug will transfer heat away from the tip rapidly, resulting in lower tip temperatures, whereas a "hotter" plug will transfer heat slowly, resulting in higher tip temperatures	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Spelling J. Oral communication K. Study skills	A. Whole numbers B. Decimals	A. Heat See Theory B. Electricity See Tune-Up I - Science Knowledge	Student will demonstrate knowledge of spark plug heat ranges by passing a written test
IX. Remove and replace spark plugs in an automobile engine, setting the electrode gap according to manufacturer specifications	Spark plugs most be periodically replaced and their electrode gap properly set for optimum performance	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Measurement B. Decimals	Electricity See Tune-Up I - Science Knowledge	Student will demonstrate an ability to properly adjust spark plug gap by achieving a moderate level of skill on a performance test

UNIT: TUNE-UP - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
X. Check for the presence of spark	Basic checks to determine why an engine will not start include checking for fuel and for ignition spark	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills		Electricity See Tune-Up I - Science Knowledge	Student will demonstrate an ability to check for the presence of spark by achieving a moderate level of skill on a performance test
XI. Perform a visual inspection of the ignition system	A. If an engine runs, but poorly, the ignition system is functioning well enough to provide high voltage spark B. Before making basic or advanced tests, the ignition system is checked for obvious problems 1. Disconnected or loose secondary cables 2. Disconnected or loose primary wiring 3. Loose distributor cap 4. Damaged distributor cap and/or rotor 5. Worn and/or damaged primary system switching device	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	Measurement	Electricity See Tune-Up I - Science Knowledge	Student will demonstrate an ability to inspect an ignition system by achieving a moderate level of skill on a performance test

UNIT: TUNE-UP - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XII. Properly adjust ignition timing on an automobile engine by using a timing light	A. A timing light is an instrument that produces a brief (1/1000 second), repeated flash of light that appears to "freeze" a moving pulley or flywheel B. The flash is triggered by the current flowing to the number one spark plug C. Thus, timing marks can be seen for checking and/or adjustment	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Whole numbers B. Measurement	Electricity 1. See Tune-Up I - Science Knowledge 2. See Theory	Student will demonstrate proper use of timing light by achieving a moderate level of skill on a performance test
XIII. Perform basic checks of the ignition system by using an oscilloscope	A. An oscilloscope is a sophisticated electronic testing device that displays changing levels of voltage in an electrical system B. Spark plug firings, as well as other electrical operations can be displayed on a screen in recognizable patterns for analysis	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/ manual E. Following directions F. Outlining and note taking G. Interpretation charts H. Interpretation graphs I. Test taking skills J. Writing skills K. Problem solving L. Spelling M. Oral communication N. Study skills	A. Decimals B. Measurement C. Ratio and proportion D. Graphs E. Whole numbers	Electricity 1. See Tune-Up I - Science Knowledge 2. See Theory	Student will demonstrate an ability to use an oscilloscope to analyze an automotive ignition system by achieving a moderate level of skill on a performance test

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XIV. Remove and replace a distributor and dead time an engine	A. For some service operations, the distributor must be removed B. Most distributors are driven by a helical gear that meshes with another gear on the camshaft C. If the distributor is removed, the relationship between ignition timing and valve timing is changed D. Dead timing is a process of replacing the distributor properly in an engine for starting purposes E. After starting, ignition timing can be reset correctly	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	Measurement		Student will demonstrate a knowledge of the procedure to dead time an engine by passing a written test and achieving a moderate level of skill on a performance test

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
XV. Perform a compression test on an automobile engine	A compression test measures cylinder compression directly and can be used to determine piston ring or valve problems	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Measurement B. Ratio and proportion C. Whole numbers	See Theory	Student will demonstrate an ability to describe and perform a compression test by achieving a moderate level of skill on a performance test
XVI. Perform vacuum gauge test on an automobile engine	A. When an engine is in good running condition, the low pressure created by the pistons on their intake stroke produces a steady vacuum in the intake manifold B. During cranking, less vacuum is produced C. Vacuum readings during cranking and idle can be analyzed to diagnose problems	A. Functional reading skills B. Vocabulary C. Fact/Opinion distinction D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Interpretation charts H. Interpretation graphs I. Test taking skills J. Writing skills K. Problem solving L. Spelling M. Oral communication N. Study skills	A. Whole numbers B. Decimals C. Measurement	Vacuum A state of air pressure below that of atmospheric pressure	Student will demonstrate ability to perform a vacuum gauge test by achieving a moderate level of skill on a performance test

UNIT: AIR CONDITIONING

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
I. Explain how refrigerant cools an air conditioning system	A. The principle upon which an air conditioning system operates is that when a liquid is converted to a gas, it absorbs heat B. Refrigeration is a process that cools C. Most refrigeration systems operate on a principle of evaporation D. In an air conditioning system, this evaporation takes place within a closed system, thus allowing the refrigerant to be used over and over again	A. Functional reading skills B. Vocabulary C. Parts of textbook/ manual D. Following directions E. Outlining and note taking F. Interpretation charts G. Test taking skills H. Writing skills I. Spelling I. Oral communication J. Study skills	A. Whole numbers B. Measurement C. Percentages	A. Chemical reactions B. Heat See Theory	Student will demonstrate a knowledge of how refrigerant cools an air conditioning system by passing a written test
II. Identify the parts of an air conditioning assembly	Parts of an air conditioning assembly include 1. Compressor 2. Condenser 3. Receiver/dryer 4. Refrigerant control 5. Evaporator 6. Controls	A. Functional reading skills B. Vocabulary C. Signal words D. Parts of textbook/ manual E. Following directions F. Outlining and note taking G. Test taking skills H. Writing skills I. Spelling J. Oral communication K. Study skills		Heat See Air Conditioning I Theory	Student will demonstrate an ability to identify the parts of an air conditioning assembly by passing a written test and by achieving a moderate level of skill on a performance test

UNIT: AIR CONDITIONING - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
III. Explain how an evaporator uses refrigerant for cooling	A. A liquid that is used to cool is called a refrigerant B. It is usually a liquid that will begin to boil and evaporate at a very low temperature C. These temperatures are well below the freezing point of water D. Automotive air conditioning refrigerant is commonly identified as R-12	A. Functional reading skill B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Writing skills H. Spelling I. Oral communication J. Study skills	A. Whole numbers B. Decimals C. Measurement	A. Chemical reactions B. Heat See Theory	Student will demonstrate a knowledge of how an evaporator uses a refrigerant for cooling by passing a written test
IV. Check refrigerant level	A. Insufficient cooling is often caused by low refrigerant level B. Restricted evaporator cores or condenser cores can be at fault C. Check the receiver/dryer for proper operation D. Hoses or tubes may be blocked or kinked	A. Functional reading skills B. Vocabulary C. Signal words D. Parts of texbook/manual E. Following directions F. Outlining and note taking G. Interpretation charts H. Test taking skills I. Writing skills J. Problem solving K. Spelling L. Oral communication M. Study skills	Measurement		Student will demonstrate an ability to check for low refrigerant level by achieving a moderate level of skill on a performance test

UNIT: AIR CONDITIONING - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
V. Check for leaks with a leak detector	A. A system that is low on refrigerant usually has a leak B. Most leaks can be located where two parts join together C. Air conditioner leaks are checked with specialized leak detecting tools	A. Functional reading skills B. Vocabulary C. Signal words D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Problem solving I. Oral communication		Chemical reactions See Air Conditioning I - Theory	Student will demonstrate an ability to locate leaks on an air conditioning system by achieving a moderate level of skill on a performance test
VI. Pressure test an automotive air conditioning system	A. A pressure test is conducted with a manifold gauge assembly B. This test determines high and low pressures in the system and helps in the diagnosis of system problems	A. Functional reading skills B. Vocabulary C. Signal words D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Interpretation charts H. Spelling I. Test taking skills J. Problem solving K. Oral communication	A. Whole numbers B. Measurement C. Graphs		Student will demonstrate a knowledge of correct procedure to follow in conducting a pressure test of an air conditioning system on an automobile by passing a written test and by achieving a moderate level of skill on a performance test

UNIT: AIR CONDITIONING - CONTINUED

TOPIC:

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
VII. Discharge an automotive air conditioning system	A. Refrigerant is discharged to eliminate pressure in an air conditioning system B. Discharging must be done in a well ventilated area	A. Functional reading skills B. Vocabulary C. Signal words D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Spelling I. Oral communication	A. Whole numbers B. Measurement C. Ratio and proportion		Student will demonstrate proper procedure for discharging an automotive air conditioning system by achieving a moderate level of skill on a performance test
VIII. Evacuate an air conditioning system	A. Whenever an air conditioning system has been opened, it must be evacuated B. A vacuum pump is used to remove air and moisture from the system	A. Functional reading skills B. Vocabulary C. Signal words D. Parts of textbook/manual E. Following directions F. Outlining and note taking G. Test taking skills H. Oral communication	Measurement		Student will demonstrate an ability to evacuate an air conditioning system by achieving a moderate level of skill on a performance test

TASK	THEORY	COMMUNICATION SKILLS	MATHEMATICS SKILLS	SCIENCE KNOWLEDGE	STUDENT OUTCOME
IX. Recharge an automobile air conditioning system with refrigerant	A. The system must be evacuated before recharging B. Use only the correct refrigerant, usually R-12 C. Follow manual directions for proper procedure for the vehicle that is being serviced	A. Functional reading skills B. Vocabulary C. Parts of textbook/manual D. Following directions E. Outlining and note taking F. Test taking skills G. Oral communication	A. Measurement B. Ratio and proportion		Student will demonstrate an ability to recharge an automobile air conditioning system by achieving a moderate level of skill on a performance test